

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

TWO WAY SLAB

(Ultimate Stress Design method in accordance with ACI 318)

(Method 2)

Slab No. **RS-1**

Project : **อาคารด้านทิศตะวันตก**

Job No. : **193018**

Rev. : **0**

Initial : **CKJ**

Date : **6-Jan-21**

Filename : **Slab S**

Concrete Strength	f_c'	=	350	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
	f_y RD	=	2400	[kg/cm ²]
Thick of Slab	h	=	15	[cm]
Clear span Length	L_a	=	500	[cm]
	L_b	=	540	[cm]
Live Load	LL	=	200	[kg/m ²]
Finishing Load	FL	=	120	[kg/m ²]

0 Siden Continuous

DB12

DL	=	360	[kg/m]
k	=	0.80	
ϕ bend	=	0.90	
ϕ Shear	=	0.85	

Cover (Short Side)	C_c	=	3.0	[cm]
Depth of Slab	d	=	12.0	[cm]
	W_u	=	1012	[kg/m]
	L_b/L_a	=	1.08	OK
La/Lb	m	=	0.926	

Shear	V_u S	=	1687	[kg/m]
	V_u L	=	1807	[kg/m]
	V_c all	=	7164	[kg/m]
	V_u L	<	V_c all	OK

Short Span

Moment	- Continue	M_u	=	0	[kg-m]
	- Not Cont.	M_u	=	0	[kg-m]
	+ Middle	M_u m	=	0	[kg-m]

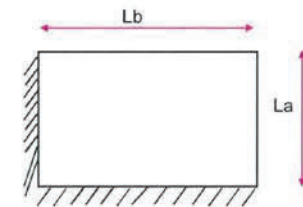
$M_u / \phi f_y j d$

As_1	=	0.00	[cm ²]	1 DB12	@	0.300	OK
As_2	=	0.00	[cm ²]	1 DB12	@	0.300	OK
As_3	=	0.00	[cm ²]	1 DB12	@	0.300	OK

Long Span

Moment	- Continue M_u	=	0	[kg-m]
	- Not Cont. M_u	=	835	[kg-m]
	+ Middle M_u m	=	1265	[kg-m]
Minimum Steel				

As_4	=	0.00	[cm ²]	1 DB12	@	0.300	OK
As_5	=	1.97	[cm ²]	2 DB12	@	0.300	OK
As_6	=	2.98	[cm ²]	3 DB12	@	0.300	OK
As min	=	3.00	[cm ²]	3 DB12	@	0.300	OK



Check h p = 0.0360
 p_{max} = 0.0270

Required d = 4.0 [cm]

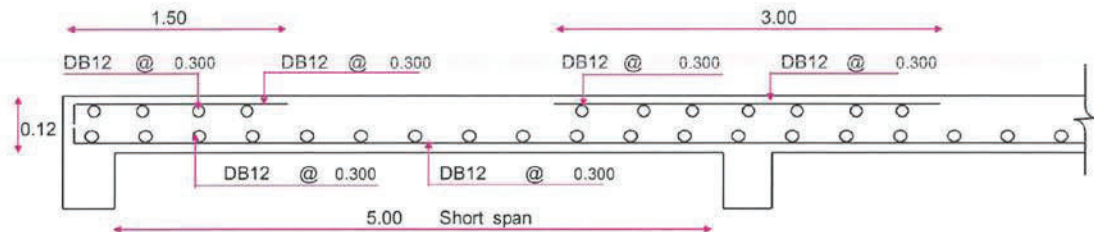
$(M_u / \phi p f_y d b^2 (1 - 0.59 p f_y / f_c'))^{0.5}$
 d < 12.0 OK

a try = 0 [cm]

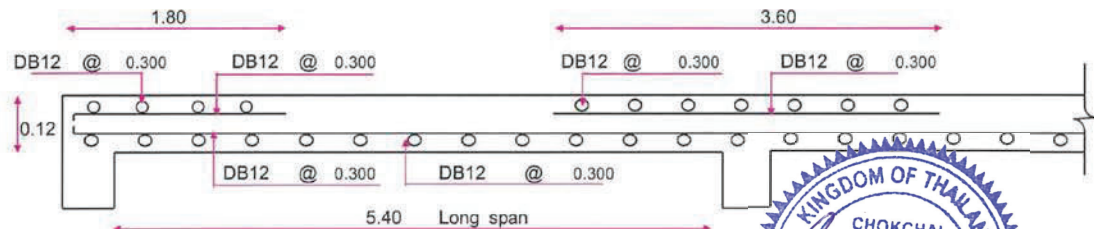
As = 2.978 [cm²]

a = 0.4004 [cm]

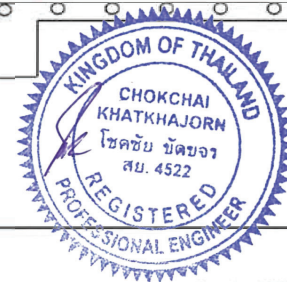
Moment arm $j d$ = 11.80 [cm]



Two Way Slab (0.15)



Two Way Slab (0.15)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

ONE WAY SLAB

(Ultimate Stress Design method in accordance with ACI 318)

Job No. : 193018

Rev. : 0

Initial : CKJ

Date : 6-Jan-21

Slab No. RS-2

Project : อาคารทิศตะวันตก

filename : Slab

Concrete Strength $f_c' = 350$ [kg/cm²]
 f_y SD = 4000 [kg/cm²]
 f_y RD = 2400 [kg/cm²]
 Clear span Length $L_n = 540$ [cm]
 Load $LL = 200$ [kg/m]

Type of Slab

Simple Support

Reinforcement Steel

DB12

Thick of Slab $DL = 360$ [kg/m]
 $h = 15$ [cm]
 $W_u = 844$ [kg/m]
 Moment $- Mu_L = 1025$ [kg-m]
 $+ Mu_m = 3076$ [kg-m]
 $- Mu_R = 1025$ [kg-m]
 Shear $V_{ur} = 2621$ [kg]
 $K = 0.80$
 $\phi = 0.90$
 $\rho = 0.0360$
 $\rho_{max} = 0.0270$
 $d = 6.2$ [cm] ($M_u / \phi \rho f_y d b^2 (1 - 0.59 \rho f_y / f_c')^{0.5}$)
 $d < h$ OK

Check Shear

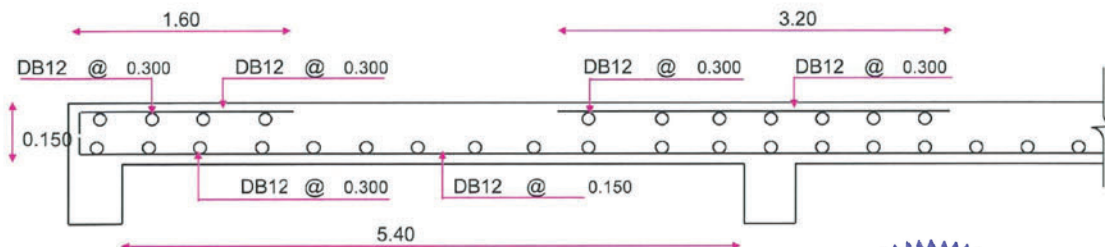
Existing Unit Shear $v_c = 2.28$ [kg/cm²]
 Allowable Shear unit $v_{all} = 8.92$ [kg/cm²]
 $v_c < v_{all}$ OK
 $a_{try} = 1.0467$ [cm]
 $As = 7.785$ [cm²]
 $a = 1.0467$ [cm]
 $j d = 14.48$ [cm]

Check Deflection

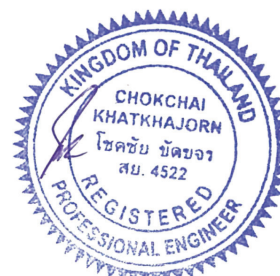
$\Delta_{all} = 1.50$ [cm]
 $\rho f_y = 15.7 < 35$ [kg/cm²]
 $I = 28125$ [cm⁴]
 $E_c = 284116$ [kg/cm²]
 $\Delta = 1.17$ [cm] $< \Delta_{all}$ OK
 $LL = 40\%$ and Coefficient = 2
 $\Delta_{Time} = 1.22 < \Delta_{all}$ OK

Moment arm

$M_u / \phi f_y j$
 $- Mu_L$ $As_L = 1.97$ [cm²] 2 DB12 @ 0.300 OK
 $+ Mu_m$ $As_m = 5.90$ [cm²] 6 DB12 @ 0.150 OK
 $- Mu_R$ $As_R = 1.97$ [cm²] 2 DB12 @ 0.300 OK
 Minimum Steel $As_{min} = 3.00$ [cm²] 3 DB12 @ 0.300 OK



One Way Slab (0.15)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

ONE WAY SLAB

(Ultimate Stress Design method in accordance with ACI 318)

Job No. : 193018

Rev. : 0

Initial : CKJ

Date : 6-Jan-21

Slab No. RDS-1

Project : อาคารทิศตะวันตก

filename : Slab

Concrete Strength $f_c' = 350$ [kg/cm²]
 f_y SD = 4000 [kg/cm²]
 f_y RD = 2400 [kg/cm²]
 Clear span Length $L_n = 420$ [cm]
 Load $LL = 1500$ [kg/m]

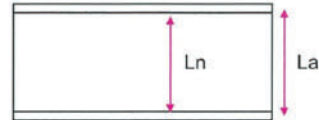
Type of Slab

Two Side Continue

Reinforcement Steel

DB12

Thick of Slab $h = 25$ [cm]
 $W_u = 3390$ [kg/m]
 Moment
 $- Mu_L = 2492$ [kg-m]
 $+ Mu_m = 4271$ [kg-m]
 $- Mu_R = 6644$ [kg-m]
 Shear
 $V_{ur} = 8187$ [kg]
 $K = 0.80$
 $\phi = 0.90$
 $\rho = 0.0360$
 $\rho_{max} = 0.0270$
 $d = 9.1$ [cm]



$$\begin{aligned} Mu &= 1/24 W_u L_n^2 & Mu &= 1/9 W_u L_n^2 \\ Mu &= 1/14 W_u L_n^2 & Mu &= 1/14 W_u L_n^2 \\ V_{ur} &= 1.15 W_u L_n / 2 \end{aligned}$$

Shear

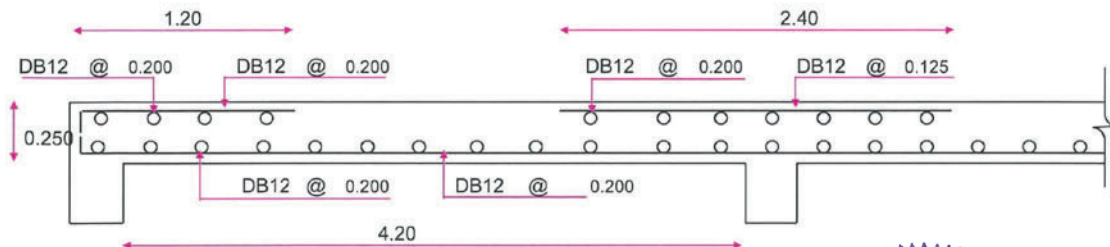
Existing Unit Shear $v_c = 3.81$ [kg/cm²]
 Allowable Shear unit $v_{all} = 8.92$ [kg/cm²]
 $v_c < v_{all}$ OK
 $a_{try} = 1.1867$ [cm]
 $As = 8.828$ [cm²]
 $a = 1.1870$ [cm]
 $j d = 24.41$ [cm]

Check Deflection

$\Delta_{all} = 1.17$ [cm]
 $\rho f_y = 12.1 < 35$ [kg/cm²]
 $I = 130208$ [cm⁴]
 $E_c = 284116$ [kg/cm²]
 $\Delta = 0.37$ [cm] $< \Delta_{all}$ OK
 LL = 40 % and Coefficient = 2
 $\Delta_{Time} = 0.26 < \Delta_{all}$ OK

Moment arm

$M_u / \phi f_y j$
 $- Mu_L$ $As_L = 2.84$ [cm²] 3 DB12 @ 0.200 OK
 $+ Mu_m$ $As_m = 4.86$ [cm²] 5 DB12 @ 0.200 OK
 $- Mu_R$ $As_R = 7.56$ [cm²] 7 DB12 @ 0.125 OK
 Minimum Steel $As_{min} = 5.00$ [cm²] 5 DB12 @ 0.200 OK



One Way Slab (0.25)





รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

5. รายการคำนวณคาน



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **B-1**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	1800	[kg-m]
$M_{neg.}$ M_u^-	=	1800	[kg-m]
$V_{max.}$ V_u	=	3000	[kg]
DL	=	1570	[kg/m]
LL	=	930	[kg/m]
Length L_n	=	240	[cm]
width b	=	15	[cm]
depth t	=	30	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 12	▼
Lower Steel	DB 12	▼
Stirrup Steel	RB 9	▼

d	=	25	[cm]
a_{try}	=	1.8621	[cm]
A_s	=	2.077	[cm ²]
a	=	1.8621	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	10.118	[cm ²]
a	=	9.069	[cm]
M_u	=	7454	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	2.26	[cm ²]
ΣA_s	=	2.077	[cm ²]
No. of steel	=	2	
A_s	=	2.26	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	3346	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	6.2	[cm]
S	=	-187.301	[cm]

Used Stirrup **RB 9 @ #N/A** **#N/A**



For Negative Moment :

Upper Steel	DB 12	▼
Lower Steel	DB 12	▼
Stirrup Steel	RB 9	▼

d	=	25	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	2.077	[cm ²]
a	=	1.8621	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	13.280	[cm ²]
a	=	11.904	[cm]
M_u	=	9107	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	2.26	[cm ²]
ΣA_s	=	2.077	[cm ²]
No. of steel	=	2	
A_s	=	2.26	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	0.67	[cm]
ρf_y	=	24	[kg/cm ²]
Y'	=	6.29	
I	=	19531	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.19	[cm]
Δ_{Time}	=	0.12	[cm]

Δ_{all} **OK**

Δ_{all} **OK**



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. B-1

Project : อาคารทิศตะวันตก

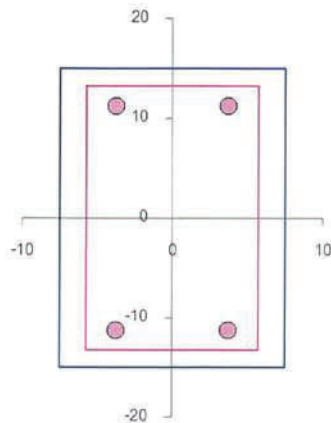
Job No. 193018

Rev. 1

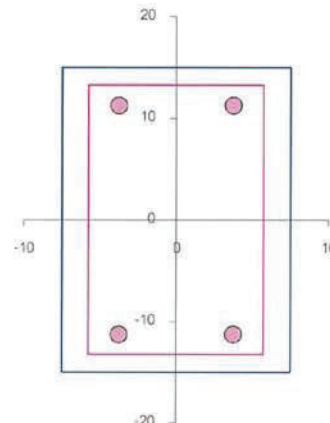
Initial CKJ

Date 14-Oct-20

File Beam B



Positive Section
B-1 (15 X 30)



Negative Section
B-1 (15 X 30)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **B-2**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
M _{pos.} Mu ⁺	=	7300	[kg-m]
M _{neg.} Mu ⁻	=	0	[kg-m]
V _{max.} Vu	=	5475	[kg]
DL	=	2285	[kg/m]
LL	=	1365	[kg/m]
Length Ln	=	300	[cm]
width b	=	20	[cm]
depth t	=	50	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a try	=	3.1386	[cm]
As	=	4.669	[cm ²]
a	=	3.1388	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p _{max}	=	0.0270	
As	=	24.283	[cm ²]
a	=	16.325	[cm]
Mu	=	32203	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	4.02	[cm ²]
Σ As	=	4.669	[cm ²]
No. of steel	=	3	
As	=	6.03	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} bd$	=	8031	[kg]
$L=Ln/2(Vu - \phi Vc)/Vu$	=	-37.0	[cm]
S	=	-45.689	[cm]

Used Stirrup **RB 9 @ #N/A** **#N/A**



For Negative Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a try	=	8.7110	[cm]
As	=	0.000	[cm ²]
a	=	3.1388	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p _{max}	=	0.0354	
As	=	31.872	[cm ²]
a	=	21.426	[cm]
Mu	=	39340	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	4.02	[cm ²]
Σ As	=	0.000	[cm ²]
No. of steel	=	2	
As	=	4.02	[cm ²]

Section OK

Check Deflection

Δ all	=	0.83	[cm]
p fy	=	27	< 35 [kg/cm ²]
Y'	=	11.8	
I	=	151875	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.09	[cm] < Δ all OK
Δ Time	=	0.03	< Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **B-2**

Project : **อาคารทิศตะวันตก**

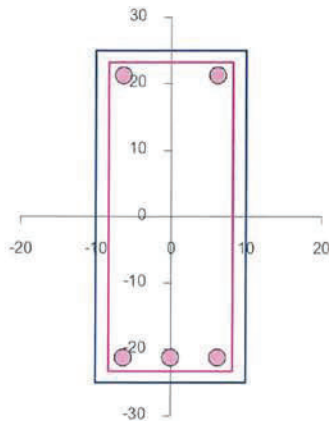
Job No. **193018**

Rev. **1**

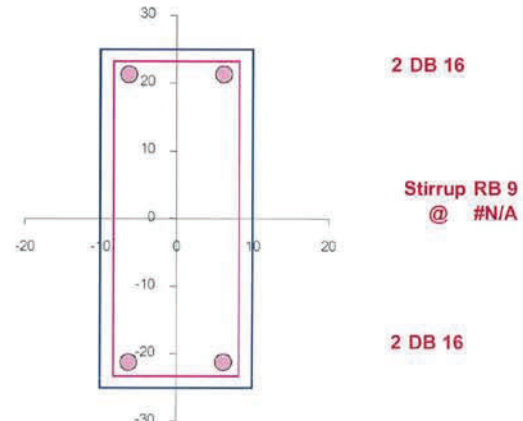
Initial **CKJ**

Date **14-Oct-20**

File **Beam B**



Positive Section
B-2 (20 X 50)



Negative Section
B-2 (20 X 50)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-2A**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
M _{pos.} Mu ⁺	=	21534	[kg-m]
M _{neg.} Mu ⁻	=	0	[kg-m]
V _{max.} Vu	=	17641	[kg]
DL	=	2930	[kg/m]
LL	=	1270	[kg/m]
Length Ln	=	550	[cm]
width b	=	25	[cm]
depth t	=	60	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	55	[cm]
a try	=	6.1979	[cm]
As	=	11.525	[cm ²]
a	=	6.1984	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	37.099	[cm ²]
a	=	19.953	[cm]
Mu	=	60133	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]
Σ As	=	11.525	[cm ²]
No. of steel	=	4	
As	=	12.57	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	12270	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	112.4	[cm]
S	=	26.581	[cm]

Used Stirrup **RB 9 @ 0.250** **OK**



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	55	[cm]
a try	=	8.7110	[cm]
As	=	0.000	[cm ²]
a	=	6.1984	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	48.693	[cm ²]
a	=	26.188	[cm]
Mu	=	73459	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]
Σ As	=	0.000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]

Section OK

Check Deflection

Δ _{all}	=	1.53	[cm]
ρ f _y	=	37	> 35 [kg/cm ²]
Y'	=	16.5	
I	=	167819	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	1.05	[cm] < Δ _{all} OK
Δ Time	=	0.69	< Δ _{all} OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-2A**

Project : **อาคารทิศตะวันตก**

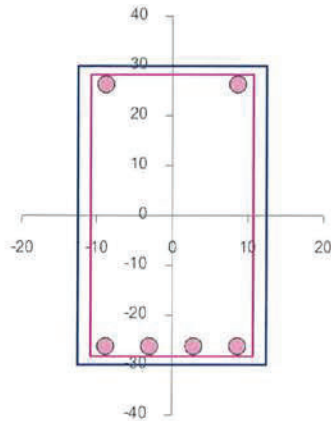
Job No. **193018**

Rev. **1**

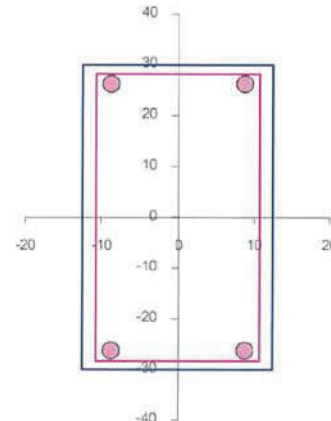
Initial **CKJ**

Date **14-Oct-20**

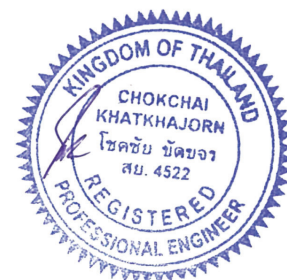
File **Beam B**



Positive Section
B-2A (25 X 60)



Negative Section
B-2A (25 X 60)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-3**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	4915	[kg-m]
$M_{neg.}$ M_u^-	=	4915	[kg-m]
$V_{max.}$ V_u	=	4494	[kg]
DL	=	1850	[kg/m]
LL	=	1360	[kg/m]
Length L_n	=	340	[cm]
width b	=	30	[cm]
depth t	=	50	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	1.3809	[cm]
A_s	=	3.081	[cm ²]
a	=	1.3809	[cm]
ϕ_{Bend}	=	0.90	
ϕ_{Shea}	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	36.425	[cm ²]
a	=	16.325	[cm]
M_u	=	48305	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]
ΣA_s	=	3.081	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	12047	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-217.4	[cm]
S	=	-15.464	[cm]

Used Stirrup **RB 9 @ #N/A** **#N/A**



For Negative Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	3.081	[cm ²]
a	=	1.3809	[cm]
ϕ_{Bend}	=	0.90	
ϕ_{Shea}	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	47.808	[cm ²]
a	=	21.426	[cm]
M_u	=	59010	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]
ΣA_s	=	3.081	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	0.94	[cm]
ρf_y	=	12	< 35 [kg/cm ²]
Y'	=	8.3	
I	=	227813	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.09	[cm] < Δ_{all} OK
Δ_{Time}	=	0.05	< Δ_{all} OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-3**

Project : **อาคารทิศตะวันตก**

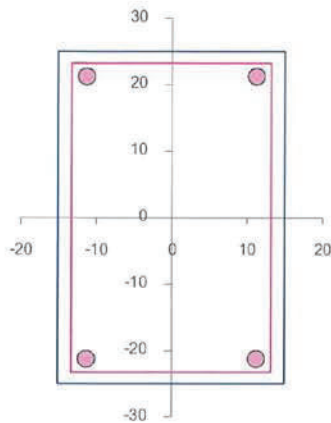
Job No. **193018**

Rev. **1**

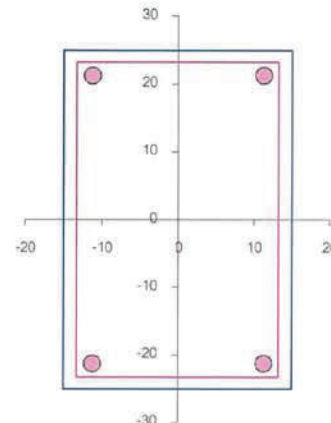
Initial **CKJ**

Date **14-Oct-20**

File **Beam B**



Positive Section
B-3 (30 X 50)



Negative Section
B-3 (30 X 50)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-3A**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

	f_c'	=	350	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
	f_y SR	=	2400	[kg/cm ²]
M _{pos.}	M_u^+	=	10355	[kg-m]
M _{neg.}	M_u^-	=	10355	[kg-m]
V _{max.}	V_u	=	11190	[kg]
	DL	=	4250	[kg/m]
	LL	=	1750	[kg/m]
Length	L_n	=	370	[cm]
width	b	=	30	[cm]
depth	t	=	50	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

	d	=	45	[cm]
	a_{try}	=	2.9622	[cm]
	A_s	=	6.610	[cm ²]
	a	=	2.9622	[cm]
ϕ Bend	=	0.90		
ϕ Shea	=	0.85		
k_1	=	0.80		
E_s	=	2040000	[kg/cm ²]	
E_c	=	284553	[kg/cm ²]	
n	=	7		
ρ	=	0.0360		
ρ_{max}	=	0.0270		
A_s	=	36.425	[cm ²]	
a	=	16.325	[cm]	
M_u	=	48305	[kg-m]	
M_1	=	0	[kg-m]	
A_s'	=	0.0000	[cm ²]	
No. of steel	=	2		
A_s	=	6.28	[cm ²]	
ΣA_s	=	6.610	[cm ²]	
No. of steel	=	3		
A_s	=	9.42	[cm ²]	

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	12047	[kg]
$L = L_n/2 (V_u - \phi V_c)/V_u$	=	15.7	[cm]
S	=	-136.259	[cm]

Used Stirrup **RB 9 @ #N/A** **#N/A**



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

	d	=	45	[cm]
	a_{try}	=	8.7110	[cm]
	A_s	=	6.610	[cm ²]
	a	=	2.9622	[cm]
ϕ Bend	=	0.90		
ϕ Shea	=	0.85		
k_1	=	1.05		
E_s	=	2040000	[kg/cm ²]	
E_c	=	284553	[kg/cm ²]	
n	=	7		
ρ	=	0.0472		
ρ_{max}	=	0.0354		
A_s	=	47.808	[cm ²]	
a	=	21.426	[cm]	
M_u	=	59010	[kg-m]	
M_1	=	0	[kg-m]	
A_s'	=	0.0000	[cm ²]	
No. of steel	=	2		
A_s	=	6.28	[cm ²]	
ΣA_s	=	6.610	[cm ²]	
No. of steel	=	3		
A_s	=	9.42	[cm ²]	

Section OK

Check Deflection

Δ_{all}	=	1.03	[cm]
ρf_y	=	28	< 35 [kg/cm ²]
Y'	=	12	
I	=	227813	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.23	[cm] < Δ_{all} OK
Δ_{Time}	=	0.09	< Δ_{all} OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-3A**

Project : **อาคารทิศตะวันตก**

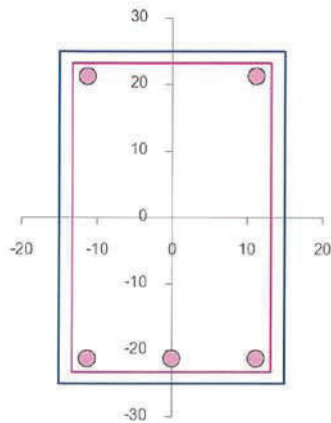
Job No. **193018**

Rev. **1**

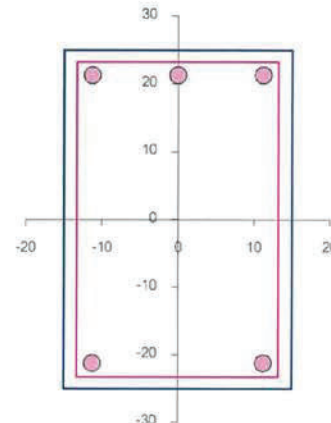
Initial **CKJ**

Date **14-Oct-20**

File **Beam B**



Positive Section
B-3A (30 X 50)



Negative Section
B-3A (30 X 50)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-3B

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 14 Oct 20

	f_c'	=	350	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
M _{pos.}	M_u^+	=	0	[kg-m]
M _{neg.}	M_u^-	=	62435	[kg-m]
V _{max.}	V_u	=	33150	[kg]
	DL	=	2040	[kg/m]
	LL	=	1360	[kg/m]
Length	L_n	=	250	[cm]
width	b	=	30	[cm]
depth	t	=	70	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	65	[cm]
a try	=	0.0000	[cm]
As	=	0.000	[cm ²]
a	=	0.0000	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	52.614	[cm ²]
a	=	23.580	[cm]
Mu	=	100784	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	0.000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	17402	[kg]
$L = L_n / (2(V_u - \phi V_c) / V_u)$	=	69.2	[cm]
S	=	32.500	[cm]

Used Stirrup 2 DB12 @ 0.300 OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	65	[cm]
a try	=	8.7110	[cm]
As	=	28.598	[cm ²]
a	=	12.8170	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	69.056	[cm ²]
a	=	30.949	[cm]
Mu	=	123120	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	28.598	[cm ²]
No. of steel	=	5	
As	=	30.79	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	0.69	[cm]
ρf_y	=	25	[kg/cm ²]
Y'	=	16.7	
I	=	686563	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.01	[cm]
Δ_{Time}	=	0.01	

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

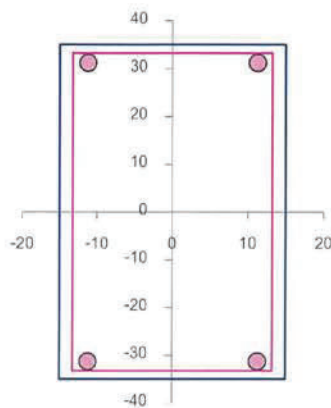
Beam Code B-3B

Project อาคารทิศตะวันตก โซน ซี

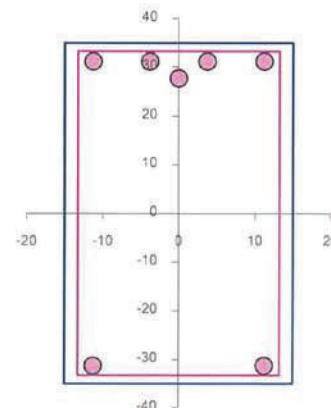
File Name Beam

Engineer CKJ

Date 14 Oct 20



Positive Section
B-3B (30 X 70)



Negative Section
B-3B (30 X 70)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-4**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	10117	[kg-m]
$M_{neg.}$ M_u^-	=	0	[kg-m]
$V_{max.}$ V_u	=	8798	[kg]
DL	=	2465	[kg/m]
LL	=	1360	[kg/m]
Length L_n	=	460	[cm]
width b	=	25	[cm]
depth t	=	50	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	3.4943	[cm]
A_s	=	6.497	[cm ²]
a	=	3.4944	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	30.354	[cm ²]
a	=	16.325	[cm]
M_u	=	40254	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	6.497	[cm ²]
No. of steel	=	3	
A_s	=	9.42	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	10039	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	6.9	[cm]
S	=	-94.093	[cm]

Used Stirrup **RB 9 @ #N/A**

#N/A



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	0.000	[cm ²]
a	=	3.4944	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	39.840	[cm ²]
a	=	21.426	[cm]
M_u	=	49175	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	0.000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.28	[cm]
ρf_y	=	34	[kg/cm ²]
Y'	=	13	
I	=	189844	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.41	[cm]
Δ_{Time}	=	0.16	

OK OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง
(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)
(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-4**

Project : **อาคารทิศตะวันตก**

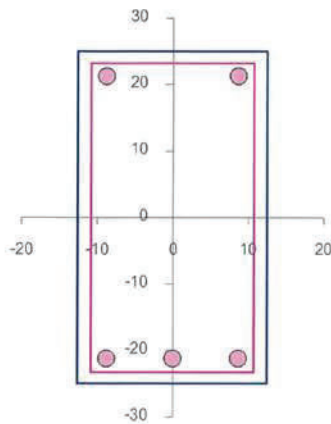
Job No. **193018**

Rev. **1**

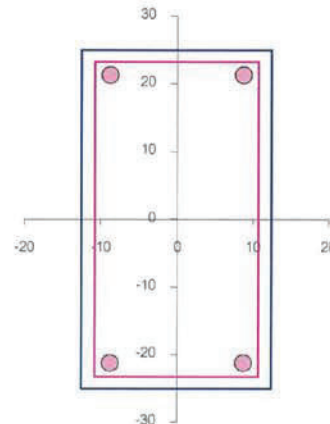
Initial **CKJ**

Date **14-Oct-20**

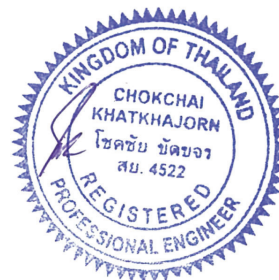
File **Beam B**



Positive Section
B-4 (25 X 50)



Negative Section
B-4 (25 X 50)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-4A**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
M _{pos.} Mu ⁺	=	12150	[kg-m]
M _{neg.} Mu ⁻	=	0	[kg-m]
V _{max.} Vu	=	12843	[kg]
DL	=	2800	[kg/m]
LL	=	1700	[kg/m]
Length Ln	=	400	[cm]
width b	=	25	[cm]
depth t	=	50	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a try	=	4.2325	[cm]
As	=	7.870	[cm ²]
a	=	4.2327	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p _{max}	=	0.0270	
As	=	30.354	[cm ²]
a	=	16.325	[cm]
Mu	=	40254	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	4.02	[cm ²]
Σ As	=	7.870	[cm ²]
No. of steel	=	4	
As	=	8.04	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	10039	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	67.1	[cm]
S	=	22.500	[cm]

Used Stirrup **RB 9 @ 0.225**

OK



For Negative Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a try	=	8.7110	[cm]
As	=	0.000	[cm ²]
a	=	4.2327	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p _{max}	=	0.0354	
As	=	39.840	[cm ²]
a	=	21.426	[cm]
Mu	=	49175	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	4.02	[cm ²]
Σ As	=	0.000	[cm ²]
No. of steel	=	2	
As	=	4.02	[cm ²]

Section OK

Check Deflection

Δ all	=	1.11	[cm]
ρ fy	=	29	< 35 [kg/cm ²]
Y'	=	12.2	
I	=	189844	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.28	[cm] < Δ all OK
Δ Time	=	0.17	< Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-4A**

Project : **อาคารทิศตะวันตก**

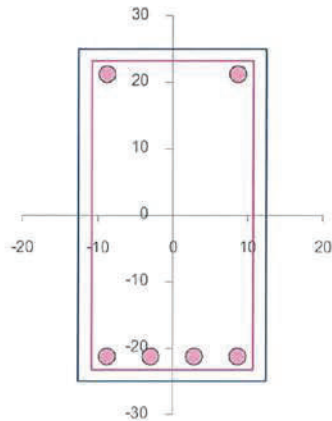
Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

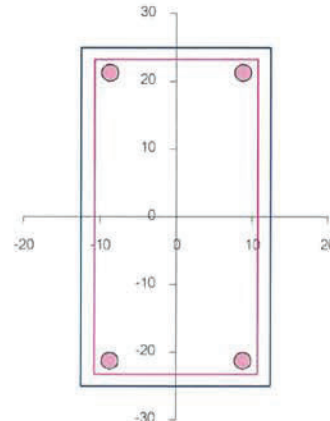


Positive Section
B-4A (25 X 50)

2 DB 16

**Stirrup RB 9
@ 0.225**

4 DB 16



Negative Section
B-4A (25 X 50)

2 DB 16

**Stirrup RB 9
@ 0.225**

2 DB 16



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-5**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **07-Jan-21**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ Mu ⁺	=	22257	[kg-m]
$M_{neg.}$ Mu ⁻	=	0	[kg-m]
$V_{max.}$ Vu	=	26175	[kg]
DL	=	2000	[kg/m]
LL	=	1800	[kg/m]
Length Ln	=	480	[cm]
width b	=	25	[cm]
depth t	=	70	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	65	[cm]
a try	=	5.3342	[cm]
As	=	9.919	[cm ²]
a	=	5.3343	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p _{max}	=	0.0270	
As	=	43.845	[cm ²]
a	=	23.580	[cm]
Mu	=	83987	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]
Σ As	=	9.919	[cm ²]
No. of steel	=	4	
As	=	12.57	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	14501	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	127.0	[cm]
S	=	14.452	[cm]

Used Stirrup: 2 RB 9 @ 0.125

OK



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	65	[cm]
a try	=	8.7110	[cm]
As	=	0.000	[cm ²]
a	=	5.3343	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p _{max}	=	0.0354	
As	=	57.546	[cm ²]
a	=	30.949	[cm]
Mu	=	102600	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]
Σ As	=	0.000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]

Section OK

Check Deflection

Δ all	=	1.33	[cm]
p fy	=	31	< 35 [kg/cm ²]
Y'	=	18.2	
I	=	572135	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.16	[cm] < Δ all OK
Δ Time	=	0.09	< Δ all OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. B-5

Project : อาคารทิศตะวันตก

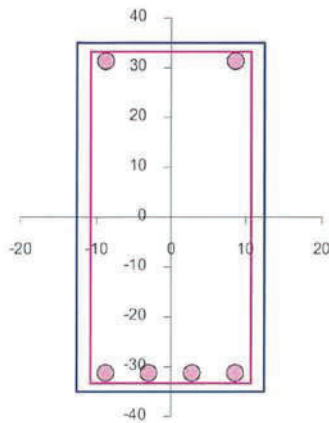
Job No. 193018

Rev. 1

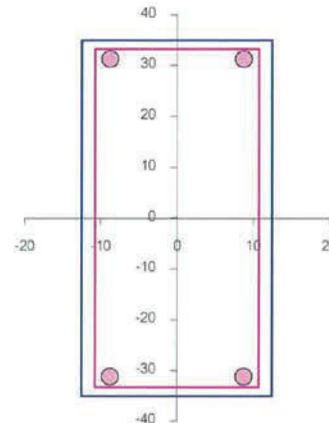
Initial CKJ

Date 07-Jan-21

File Beam B



Positive Section
B-5 (25 X 70)



Negative Section
B-5 (25 X 70)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-5A**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
M _{pos.} Mu ⁺	=	50208	[kg-m]
M _{neg.} Mu ⁻	=	25000	[kg-m]
V _{max.} Vu	=	25150	[kg]
DL	=	2750	[kg/m]
LL	=	1350	[kg/m]
Length Ln	=	620	[cm]
width b	=	30	[cm]
depth t	=	70	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	65	[cm]
a try	=	10.4575	[cm]
As	=	23.333	[cm ²]
a	=	10.4576	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	52.614	[cm ²]
a	=	23.580	[cm]
Mu	=	100784	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	9.82	[cm ²]
Σ As	=	23.333	[cm ²]
No. of steel	=	5	
As	=	24.54	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	17402	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	127.7	[cm]
S	=	21.774	[cm]

Used Stirrup **RB 9 @ 0.200**

OK



For Negative Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	65	[cm]
a try	=	8.7110	[cm]
As	=	11.618	[cm ²]
a	=	10.4576	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	69.056	[cm ²]
a	=	30.949	[cm]
Mu	=	123120	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	9.82	[cm ²]
Σ As	=	11.618	[cm ²]
No. of steel	=	3	
As	=	14.73	[cm ²]

Section OK

Check Deflection

Δ _{all}	=	1.72	[cm]
ρ f _y	=	50	[kg/cm ²]
Y'	=	22.2	
I	=	424129	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.65	[cm]
Δ Time	=	1.05	

OK

OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-5A**

Project : **อาคารทิศตะวันตก**

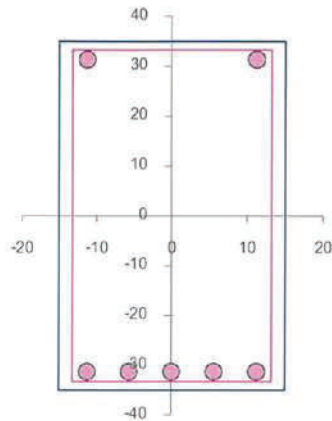
Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

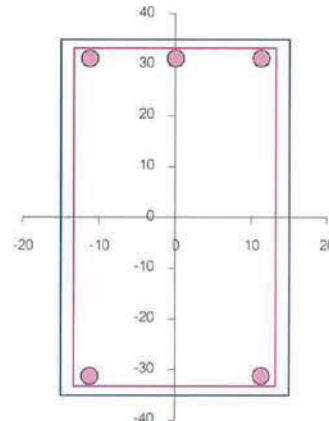


Positive Section
B-5A (30 X 70)

2 DB 25

Stirrup RB 9
@ 0.200

5 DB 25



Negative Section
B-5A (30 X 70)

3 DB 25

Stirrup RB 9
@ 0.200

2 DB 25



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-6**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ Mu ⁺	=	13250	[kg-m]
$M_{neg.}$ Mu ⁻	=	13250	[kg-m]
$V_{max.}$ Vu	=	11925	[kg]
DL	=	2935	[kg/m]
LL	=	1835	[kg/m]
Length Ln	=	500	[cm]
width b	=	25	[cm]
depth t	=	50	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a try	=	4.6378	[cm]
As	=	8.623	[cm ²]
a	=	4.6378	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	30.354	[cm ²]
a	=	16.325	[cm]
Mu	=	40254	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]
Σ As	=	8.623	[cm ²]
No. of steel	=	3	
As	=	9.42	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	10039	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	71.1	[cm]
S	=	22.500	[cm]

Used Stirrup **RB 9 @ 0.225**

OK



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a try	=	8.7110	[cm]
As	=	8.623	[cm ²]
a	=	4.6378	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	39.840	[cm ²]
a	=	21.426	[cm]
Mu	=	49175	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]
Σ As	=	8.623	[cm ²]
No. of steel	=	3	
As	=	9.42	[cm ²]

Section OK

Check Deflection

Δ _{all}	=	1.39	[cm]
ρ f _y	=	34	[kg/cm ²]
Y'	=	13	
I	=	189844	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.72	[cm]
Δ Time	=	0.28	

OK

OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-6**

Project : **อาคารทิศตะวันตก**

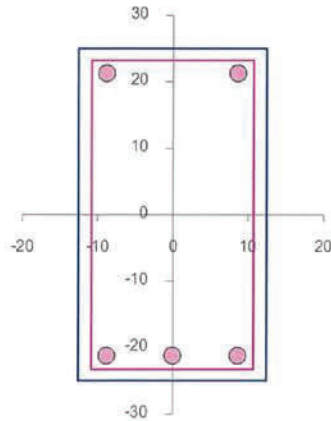
Job No. **193018**

Rev. **1**

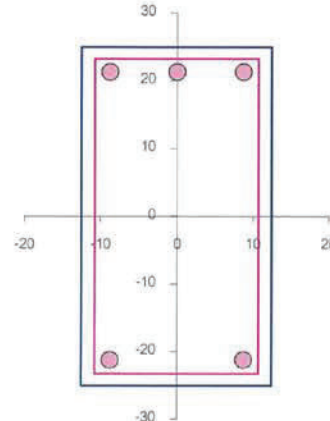
Initial **CKJ**

Date **14-Oct-20**

File **Beam B**



Positive Section
B-6 (25 X 50)



Negative Section
B-6 (25 X 50)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-6A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	0	[kg-m]
$M_{neg.}$ M_u^-	=	44574	[kg-m]
$V_{max.}$ V_u	=	28600	[kg]
DL	=	2100	[kg/m]
LL	=	700	[kg/m]
Length L_n	=	170	[cm]
width b	=	30	[cm]
depth t	=	70	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

d	=	65	[cm]
a_{try}	=	0.0000	[cm]
A_s	=	0.000	[cm ²]
a	=	0.0000	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	52.614	[cm ²]
a	=	23.580	[cm]
M_u	=	100784	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	0.000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	17402	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	41.0	[cm]
S	=	32.500	[cm]
Used Stirrup	2	DB12 @ 0.300	

OK



For Negative Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

d	=	65	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	20.417	[cm ²]
a	=	9.1504	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	69.056	[cm ²]
a	=	30.949	[cm]
M_u	=	123120	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	20.417	[cm ²]
No. of steel	=	5	
A_s	=	24.54	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	0.47	[cm]
ρf_y	=	20	[kg/cm ²]
Y'	=	15.1	
I	=	686563	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.00	[cm]
Δ_{Time}	=	0	

OK

OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

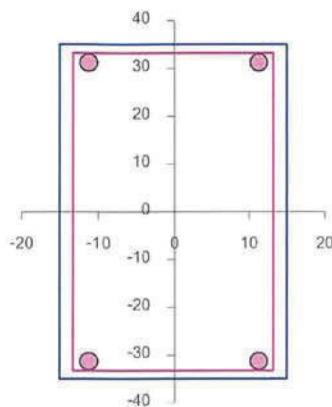
Beam Code B-6A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21

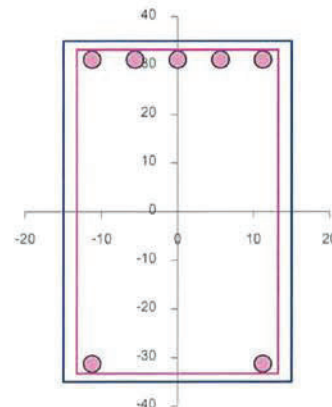


Positive Section
B-6A (30 X 70)

2 DB25

2 DB12
@ 0.300

2 DB25

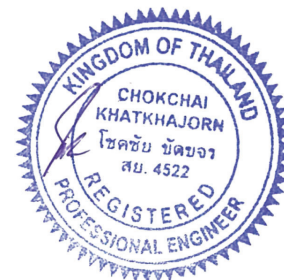


Negative Section
B-6A (30 X 70)

5 DB25

2 DB12
@ 0.300

2 DB25



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-7

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 14 Oct 20

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	59590	[kg-m]
M _{neg.}	Mu ⁻	=	0	[kg-m]
V _{max.}	Vu	=	31708	[kg]
	DL	=	3590	[kg/m]
	LL	=	2040	[kg/m]
Length	Ln	=	860	[cm]
width	b	=	40	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB25	▼
Lower Steel	DB25	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a try	=	7.8269	[cm]
As	=	23.285	[cm ²]
a	=	7.8270	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	80.944	[cm ²]
a	=	27.208	[cm]
Mu	=	178907	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	9.82	[cm ²]
Σ As	=	23.285	[cm ²]
No. of steel	=	5	
As	=	24.54	[cm ²]

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	26772	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	121.4	[cm]
S	=	37.500	[cm]

Used Stirrup 1 DB12 @ 0.360 OK



For Negative Moment :

Upper Steel	DB25	▼
Lower Steel	DB25	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a try	=	8.7110	[cm]
As	=	0.000	[cm ²]
a	=	0.0000	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	106.239	[cm ²]
a	=	35.711	[cm]
Mu	=	218556	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	9.82	[cm ²]
Σ As	=	0.000	[cm ²]
No. of steel	=	2	
As	=	9.82	[cm ²]

Section OK

Check Deflection

Δ all	=	2.39	[cm]
ρ fy	=	33	[kg/cm ²]
Y'	=	21.4	
I	=	1406250	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	1.00	[cm]
Δ Time	=	1.57	

Δ all OK
Δ all OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

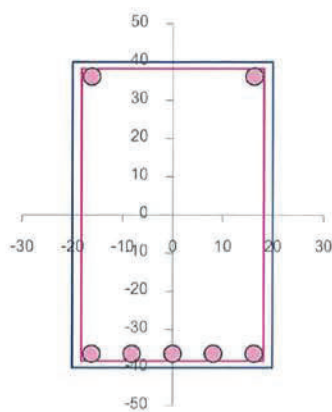
Beam Code B-7

Project อาคารทิศตะวันตก โซน ซี

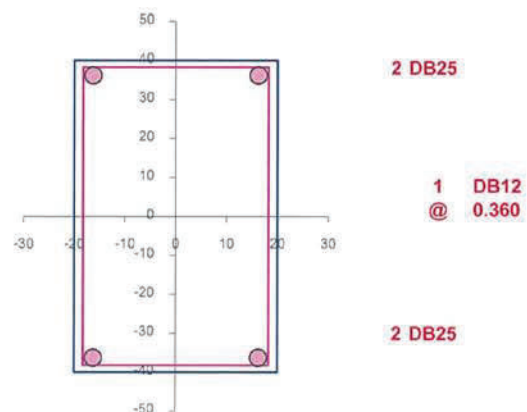
File Name Beam

Engineer CKJ

Date 14 Oct 20



Positive Section
B-7 (40 X 80)



Negative Section
B-7 (40 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-7A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$ M_u^+	=	45220	[kg-m]
$M_{neg.}$ M_u^-	=	0	[kg-m]
$V_{max.}$ V_u	=	55446	[kg]
DL	=	3360	[kg/m]
LL	=	1240	[kg/m]
Length L_n	=	810	[cm]
width b	=	100	[cm]
depth t	=	60	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

d	=	55	[cm]
a_{try}	=	3.1616	[cm]
A_s	=	23.514	[cm ²]
a	=	3.1616	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	148.398	[cm ²]
a	=	19.953	[cm]
M_u	=	240531	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	23.514	[cm ²]
No. of steel	=	5	
A_s	=	24.54	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	49081	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	100.3	[cm]
S	=	27.500	[cm]
Used Stirrup	2	DB12 @ 0.250	

OK



For Negative Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

d	=	55	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	0.000	[cm ²]
a	=	0.0000	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	194.772	[cm ²]
a	=	26.188	[cm]
M_u	=	293837	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	0.000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.25	[cm]
ρf_y	=	18	[kg/cm ²]
Y'	=	12.1	
I	=	1386458	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.65	[cm]
Δ_{Time}	=	1.1	

Δ_{all} OK

Δ_{all} OK



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

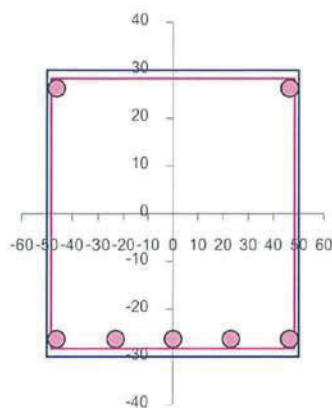
Beam Code B-7A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21



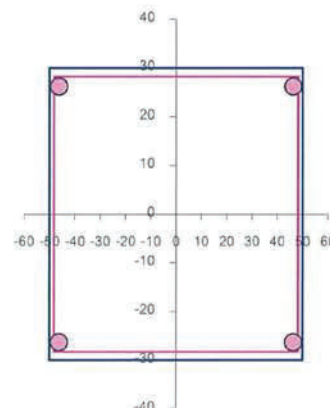
2 DB25

2 DB12
@ 0.250

5 DB25

Positive Section

B-7A (100 X 60)



2 DB25

2 DB12
@ 0.250

2 DB25

Negative Section

B-7A (100 X 60)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-7B

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	73178	[kg-m]
M _{neg.}	Mu ⁻	=	0	[kg-m]
V _{max.}	Vu	=	38254	[kg]
	DL	=	2360	[kg/m]
	LL	=	790	[kg/m]
Length	Ln	=	800	[cm]
width	b	=	50	[cm]
depth	t	=	60	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB25	▼
Lower Steel	DB25	▼
Stirrup Steel	DB12	▼

	d	=	55	[cm]
	a try	=	11.0481	[cm]
	As	=	41.085	[cm ²]
	a	=	11.0481	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	0.80		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0360		
p _{max}	=	0.0270		
As	=	74.199	[cm ²]	
a	=	19.953	[cm]	
Mu	=	120266	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	9.82	[cm ²]	
Σ As	=	41.085	[cm ²]	
No. of steel	=	9		
As	=	44.18	[cm ²]	

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	24541	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	181.9	[cm]
S	=	27.500	[cm]
Used Stirrup	2	DB12 @ 0.250	

OK



For Negative Moment :

Upper Steel	DB25	▼
Lower Steel	DB25	▼
Stirrup Steel	DB12	▼

	d	=	55	[cm]
	a try	=	8.7110	[cm]
	As	=	0.000	[cm ²]
	a	=	0.0000	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	1.05		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0472		
p _{max}	=	0.0354		
As	=	97.386	[cm ²]	
a	=	26.188	[cm]	
Mu	=	146918	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	9.82	[cm ²]	
Σ As	=	0.000	[cm ²]	
No. of steel	=	2		
As	=	9.82	[cm ²]	

Section OK

Check Deflection

Δ all	=	2.22	[cm]	
ρ fy	=	64	>	35 [kg/cm ²]
Y'	=	20.6		
I	=	511651	[cm ⁴]	
Ec	=	284116	[kg/cm ²]	
Δ	=	1.16	[cm]	< Δ all OK
Δ Time	=	1.96	<	Δ all OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

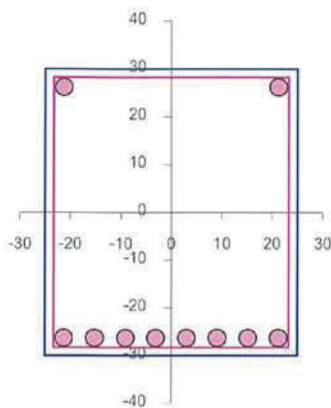
Beam Code B-7B

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21



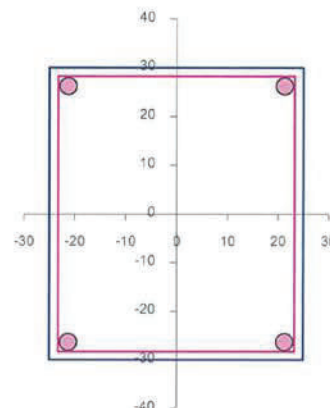
2 DB25

2 DB12
@ 0.250

9 DB25

Positive Section

B-7B (50 X 60)



2 DB25

2 DB12
@ 0.250

2 DB25

Negative Section

B-7B (50 X 60)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-8

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 14 Oct 20

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu*	=	58220	[kg-m]
M _{neg.}	Mu*	=	0	[kg-m]
V _{max.}	Vu	=	28794	[kg]
	DL	=	2000	[kg/m]
	LL	=	500	[kg/m]
Length	Ln	=	800	[cm]
width	b	=	25	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d"	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB25	▼
Lower Steel	DB25	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	12.6665	[cm]
	As	=	23.552	[cm ²]
	a	=	12.6665	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	0.80		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0360		
p _{max}	=	0.0270		
As	=	50.590	[cm ²]	
a	=	27.208	[cm]	
Mu	=	111817	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	9.82	[cm ²]	
Σ As	=	23.552	[cm ²]	
No. of steel	=	5		
As	=	24.54	[cm ²]	

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	16732	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	202.4	[cm]
S	=	37.500	[cm]

Used Stirrup 1 DB12 @ 0.360 **OK**



For Negative Moment :

Upper Steel	DB25	▼
Lower Steel	DB25	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	8.7110	[cm]
	As	=	0.000	[cm ²]
	a	=	0.0000	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	1.05		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0472		
p _{max}	=	0.0354		
As	=	66.400	[cm ²]	
a	=	35.711	[cm]	
Mu	=	136598	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	9.82	[cm ²]	
Σ As	=	0.000	[cm ²]	
No. of steel	=	2		
As	=	9.82	[cm ²]	

Section OK

Check Deflection

Δ all	=	2.22	[cm]	
ρ fy	=	52	>	35 [kg/cm ²]
Y'	=	26		
I	=	558971	[cm ⁴]	
Ec	=	284116	[kg/cm ²]	
Δ	=	0.84	[cm]	< Δ all OK
Δ Time	=	1.48	<	Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

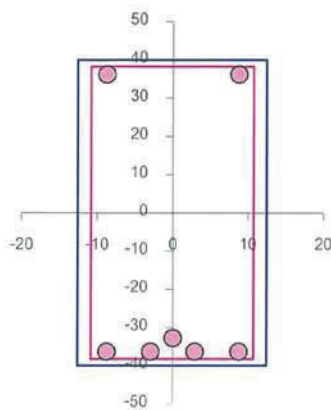
Beam Code B-8

Project อาคารทิศตะวันตก โซน ซี

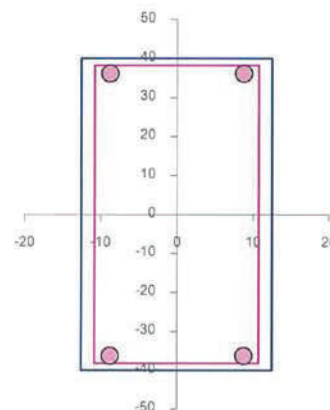
File Name Beam

Engineer CKJ

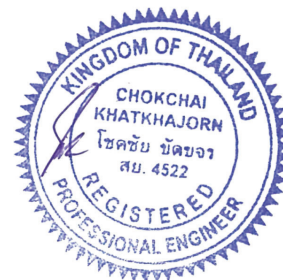
Date 14 Oct 20



Positive Section
B-8 (25 X 80)



Negative Section
B-8 (25 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-9

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	114968	[kg-m]
M _{neg.}	Mu ⁻	=	0	[kg-m]
V _{max.}	Vu	=	63026	[kg]
	DL	=	3450	[kg/m]
	LL	=	1350	[kg/m]
Length	Ln	=	700	[cm]
width	b	=	80	[cm]
depth	t	=	60	[cm]
	d'	=	5	[cm]
siding	d"	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	55	[cm]
a try	=	10.8230	[cm]
As	=	64.401	[cm ²]
a	=	10.8237	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	118.718	[cm ²]
a	=	19.953	[cm]
Mu	=	192425	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	64.401	[cm ²]
No. of steel	=	11	
As	=	67.73	[cm ²]

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	39265	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	164.7	[cm]
S	=	27.500	[cm]
Used Stirrup	2	DB12 @ 0.250	

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	55	[cm]
a try	=	8.7110	[cm]
As	=	0.000	[cm ²]
a	=	0.0000	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p _{max}	=	0.0354	
As	=	155.818	[cm ²]
a	=	26.188	[cm]
Mu	=	235070	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	0.000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]

Section OK

Check Deflection

Δ all	=	1.94	[cm]
p fy	=	62	> 35 [kg/cm ²]
Y'	=	20.3	
I	=	793972	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.67	[cm] < Δ all OK
Δ Time	=	1.11	< Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

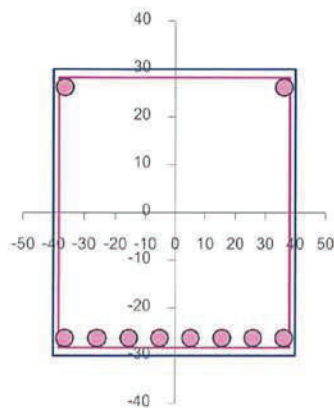
Beam Code B-9

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21

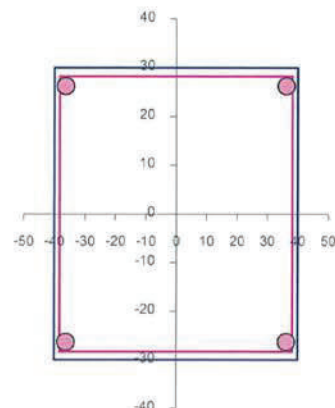


Positive Section
B-9 (80 X 60)

2 DB28

2 DB12
@ 0.250

11 DB28

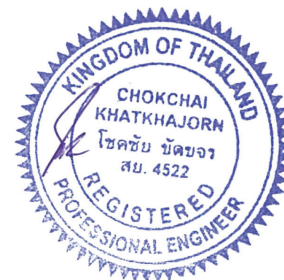


Negative Section
B-9 (80 X 60)

2 DB28

2 DB12
@ 0.250

2 DB28



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-10

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 14 Oct 20

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
M _{pos.} Mu ⁺	=	109562	[kg-m]
M _{neg.} Mu ⁻	=	54500	[kg-m]
V _{max.} Vu	=	45626	[kg]
DL	=	4600	[kg/m]
LL	=	1200	[kg/m]
Length Ln	=	700	[cm]
width b	=	30	[cm]
depth t	=	80	[cm]
d'	=	7.5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	72.5	[cm]
a try	=	22.2180	[cm]
As	=	49.574	[cm ²]
a	=	22.2180	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p _{max}	=	0.0270	
As	=	58.685	[cm ²]
a	=	26.301	[cm]
Mu	=	125384	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	49.574	[cm ²]
No. of steel	=	9	
As	=	55.42	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} bd$	=	19409	[kg]
$L=Ln/2(Vu - \phi Vc)/Vu$	=	223.4	[cm]
S	=	36.250	[cm]

Used Stirrup 2 DB12 @ 0.360 OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	72.5	[cm]
a try	=	8.7110	[cm]
As	=	22.216	[cm ²]
a	=	9.9567	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p _{max}	=	0.0354	
As	=	77.024	[cm ²]
a	=	34.520	[cm]
Mu	=	153172	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	22.216	[cm ²]
No. of steel	=	4	
As	=	24.63	[cm ²]

Section OK

Check Deflection

Δ all	=	1.94	[cm]
ρ fy	=	102	[kg/cm ²]
Y'	=	32.3	
I	=	963881	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.66	[cm]
Δ Time	=	1.16	

Δ all OK
Δ all OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

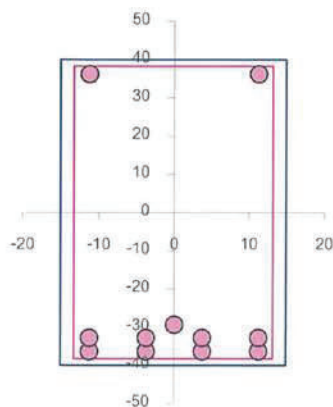
Beam Code B-10

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 14 Oct 20



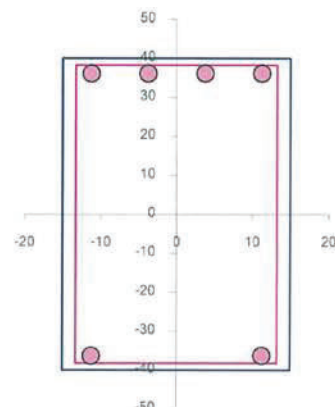
2 DB28

2 DB12
@ 0.360

9 DB28

Positive Section

B-10 (30 X 80)



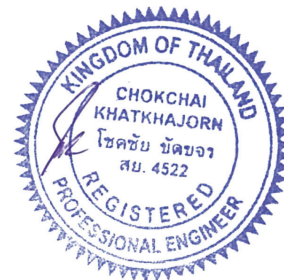
4 DB28

2 DB12
@ 0.360

2 DB28

Negative Section

B-10 (30 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-11

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	102799	[kg-m]
M _{neg.}	Mu ⁻	=	52000	[kg-m]
V _{max.}	Vu	=	50565	[kg]
	DL	=	4590	[kg/m]
	LL	=	1360	[kg/m]
Length	Ln	=	700	[cm]
width	b	=	40	[cm]
depth	t	=	80	[cm]
	d'	=	7.5	[cm]
siding	d"	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	72.5	[cm]
a try	=	14.7370	[cm]
As	=	43.843	[cm ²]
a	=	14.7370	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	78.246	[cm ²]
a	=	26.301	[cm]
Mu	=	167179	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	43.843	[cm ²]
No. of steel	=	8	
As	=	49.26	[cm ²]

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	25879	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	197.7	[cm]
S	=	36.250	[cm]
Used Stirrup	2	DB12 @ 0.360	

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	72.5	[cm]
a try	=	8.7110	[cm]
As	=	21.197	[cm ²]
a	=	7.1250	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	102.698	[cm ²]
a	=	34.520	[cm]
Mu	=	204229	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	21.197	[cm ²]
No. of steel	=	4	
As	=	24.63	[cm ²]

Section OK

Check Deflection

Δ all	=	1.94	[cm]
p fy	=	68	> 35 [kg/cm ²]
Y'	=	27.8	
I	=	975449	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.67	[cm] < Δ all OK
Δ Time	=	1.16	< Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

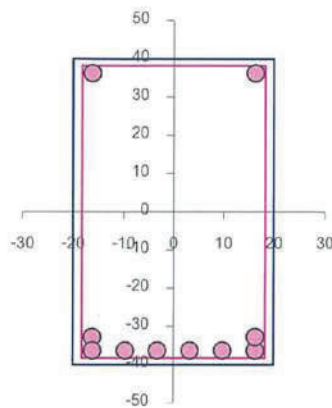
Beam Code B-11

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21



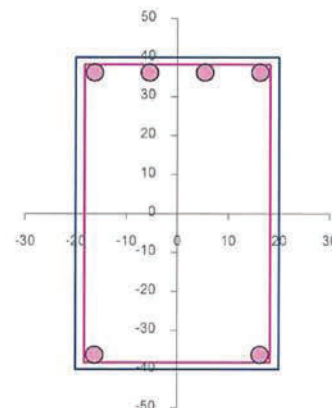
Positive Section

B-11 (40 X 80)

2 DB28

2 DB12
@ 0.360

8 DB28



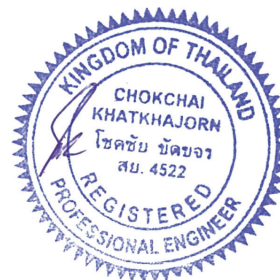
Negative Section

B-11 (40 X 80)

4 DB28

2 DB12
@ 0.360

2 DB28



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code B-11A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	62744	[kg-m]
M _{neg.}	Mu ⁻	=	31400	[kg-m]
V _{max.}	Vu	=	37372	[kg]
	DL	=	4590	[kg/m]
	LL	=	1400	[kg/m]
Length	Ln	=	560	[cm]
width	b	=	40	[cm]
depth	t	=	80	[cm]
	d'	=	7.5	[cm]
siding	d"	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	72.5	[cm]
a try	=	8.5894	[cm]
As	=	25.554	[cm ²]
a	=	8.5894	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	78.246	[cm ²]
a	=	26.301	[cm]
Mu	=	167179	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	25.554	[cm ²]
No. of steel	=	5	
As	=	30.79	[cm ²]

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	25879	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	115.2	[cm]
S	=	36.250	[cm]
Used Stirrup	2	DB12 @ 0.360	

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	72.5	[cm]
a try	=	8.7110	[cm]
As	=	12.800	[cm ²]
a	=	4.3024	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	102.698	[cm ²]
a	=	34.520	[cm]
Mu	=	204229	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	12.800	[cm ²]
No. of steel	=	3	
As	=	18.47	[cm ²]

Section OK

Check Deflection

Δ all	=	1.56	[cm]
p fy	=	42	> 35 [kg/cm ²]
Y'	=	23.1	
I	=	690281	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.39	[cm] < Δ all OK
Δ Time	=	0.67	< Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

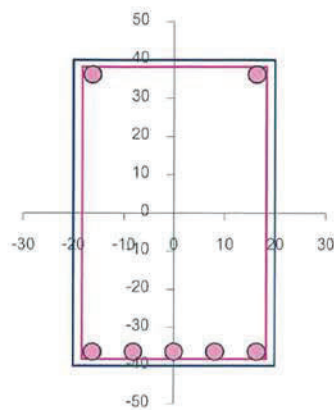
Beam Code B-11A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

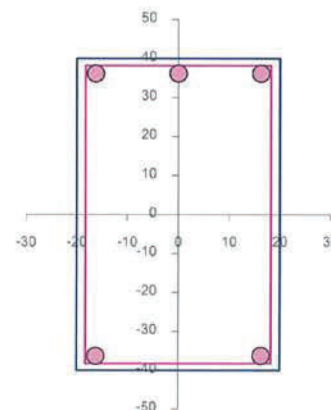
Engineer CKJ

Date 7 Jan 21



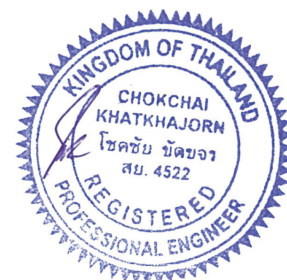
Positive Section

B-11A (40 X 80)



Negative Section

B-11A (40 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-11B**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **14-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	10355	[kg-m]
$M_{neg.}$ M_u^-	=	10355	[kg-m]
$V_{max.}$ V_u	=	11190	[kg]
DL	=	4250	[kg/m]
LL	=	1750	[kg/m]
Length L_n	=	370	[cm]
width b	=	30	[cm]
depth t	=	60	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	55	[cm]
a_{try}	=	2.3961	[cm]
A_s	=	5.346	[cm ²]
a	=	2.3961	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	44.519	[cm ²]
a	=	19.953	[cm]
M_u	=	72159	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	5.346	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	14724	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-21.9	[cm]
S	=	-40.391	[cm]

Used Stirrup **RB 9 @ #N/A**

#N/A



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	55	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	5.346	[cm ²]
a	=	2.3961	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	58.432	[cm ²]
a	=	26.188	[cm]
M_u	=	88151	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	5.346	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.03	[cm]
ρf_y	=	15	[kg/cm ²]
Y'	=	11.3	
I	=	415938	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.12	[cm]
Δ_{Time}	=	0.08	



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **B-11B**

Project : **อาคารทิศตะวันตก**

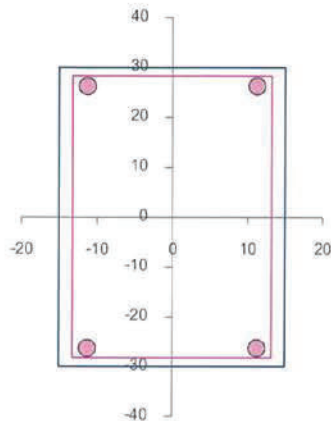
Job No. **193018**

Rev. **1**

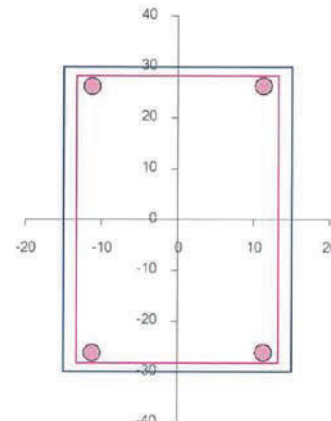
Initial **CKJ**

Date **14-Oct-20**

File **Beam B**



Positive Section
B-11B (30 X 60)



Negative Section
B-11B (30 X 60)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-12

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 14 Oct 20

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	58114	[kg-m]
M _{neg.}	Mu ⁻	=	0	[kg-m]
V _{max.}	Vu	=	34800	[kg]
	DL	=	4300	[kg/m]
	LL	=	1350	[kg/m]
Length	Ln	=	760	[cm]
width	b	=	30	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	10.3623	[cm]
	As	=	23.121	[cm ²]
	a	=	10.3623	[cm]
φ Bend		=	0.90	
φ Shea		=	0.85	
k1		=	0.80	
Es		=	2040000	[kg/cm ²]
Ec		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0360	
ρ _{max}		=	0.0270	
As		=	60.708	[cm ²]
a		=	27.208	[cm]
Mu		=	134181	[kg-m]
M1		=	0	[kg-m]
As'		=	0.0000	[cm ²]
No. of steel		=	2	
As		=	12.32	[cm ²]
Σ As		=	23.121	[cm ²]
No. of steel		=	4	
As		=	24.63	[cm ²]

Section OK

Stirrup Design

	0.53 φ (fc') ^{0.5} bd	=	20079	[kg]
	L=Ln/2(Vu - φ Vc)/Vu	=	193.6	[cm]
	S	=	37.500	[cm]

Used Stirrup 1 DB12 @ 0.360 OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	8.7110	[cm]
	As	=	0.000	[cm ²]
	a	=	0.0000	[cm]
φ Bend		=	0.90	
φ Shea		=	0.85	
k1		=	1.05	
Es		=	2040000	[kg/cm ²]
Ec		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0472	
ρ _{max}		=	0.0354	
As		=	79.680	[cm ²]
a		=	35.711	[cm]
Mu		=	163917	[kg-m]
M1		=	0	[kg-m]
As'		=	0.0000	[cm ²]
No. of steel		=	2	
As		=	12.32	[cm ²]
Σ As		=	0.000	[cm ²]
No. of steel		=	2	
As		=	12.32	[cm ²]

Section OK

Check Deflection

Δ all	=	2.11	[cm]
ρ fy	=	44	> 35 [kg/cm ²]
Y'	=	24.2	
I	=	586654	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	1.47	[cm] < Δ all OK
Δ Time	=	1.01	< Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

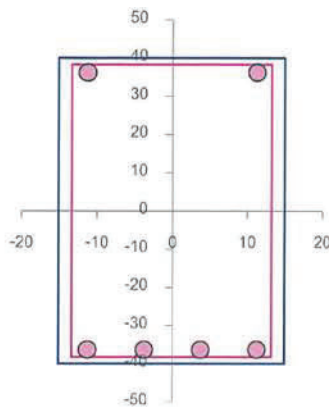
Beam Code B-12

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

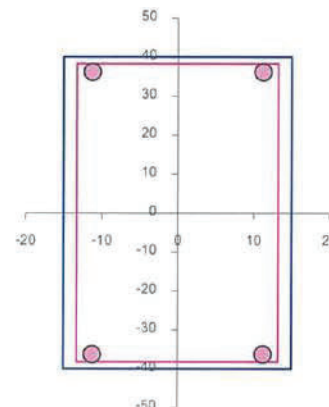
Engineer CKJ

Date 14 Oct 20



Positive Section

B-12 (30 X 80)



Negative Section

B-12 (30 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-1 EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code B-12A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	73178	[kg-m]
M _{neg.}	Mu ⁻	=	0	[kg-m]
V _{max.}	Vu	=	38254	[kg]
	DL	=	2750	[kg/m]
	LL	=	1000	[kg/m]
Length	Ln	=	760	[cm]
width	b	=	50	[cm]
depth	t	=	60	[cm]
	d'	=	5	[cm]
siding	d"	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	55	[cm]
a try	=	11.0478	[cm]
As	=	41.085	[cm ²]
a	=	11.0480	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	74.199	[cm ²]
a	=	19.953	[cm]
Mu	=	120266	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	41.085	[cm ²]
No. of steel	=	7	
As	=	43.10	[cm ²]

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	24541	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	172.8	[cm]
S	=	27.500	[cm]
Used Stirrup	2	DB12 @ 0.250	

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	55	[cm]
a try	=	8.7110	[cm]
As	=	0.000	[cm ²]
a	=	0.0000	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	97.386	[cm ²]
a	=	26.188	[cm]
Mu	=	146918	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	0.000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]

Section OK

Check Deflection

Δ all	=	2.11	[cm]
p fy	=	63	> 35 [kg/cm ²]
Y'	=	20.4	
I	=	502699	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	1.14	[cm] < Δ all OK
Δ Time	=	1.92	< Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

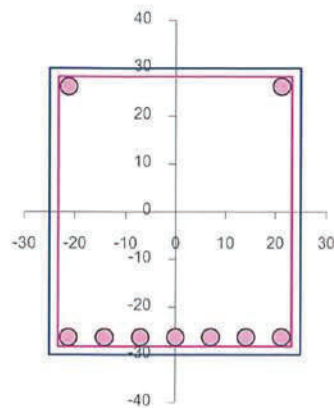
Beam Code B-12A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21



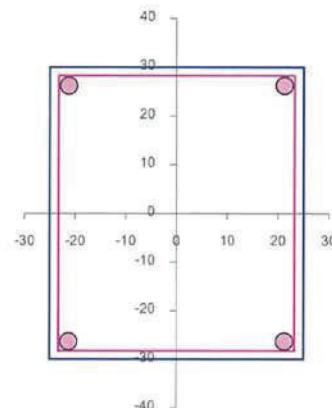
Positive Section

B-12A (50 X 60)

2 DB28

2 DB12
@ 0.250

7 DB28



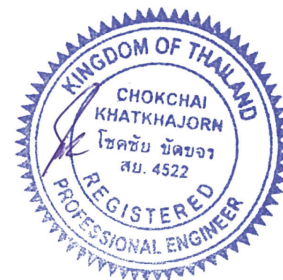
Negative Section

B-12A (50 X 60)

2 DB28

2 DB12
@ 0.250

2 DB28



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-1 EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code B-13

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Jan 21

	f_c'	=	350	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$	M_u^+	=	100000	[kg-m]
$M_{neg.}$	M_u^-	=	50000	[kg-m]
$V_{max.}$	V_u	=	45000	[kg]
	DL	=	4600	[kg/m]
	LL	=	1200	[kg/m]
Length	L_n	=	760	[cm]
width	b	=	30	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a_{try}	=	19.0079	[cm]
	A_s	=	42.411	[cm ²]
	a	=	19.0079	[cm]
ϕ Bend		=	0.90	
ϕ Shea		=	0.85	
k_1		=	0.80	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0360	
ρ_{max}		=	0.0270	
A_s		=	60.708	[cm ²]
a		=	27.208	[cm]
M_u		=	134181	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	12.32	[cm ²]
ΣA_s		=	42.411	[cm ²]
No. of steel		=	7	
A_s		=	43.10	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	20079	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	235.9	[cm]
S	=	37.500	[cm]
Used Stirrup	2	DB12 @ 0.360	

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a_{try}	=	8.7110	[cm]
	A_s	=	19.660	[cm ²]
	a	=	8.8113	[cm]
ϕ Bend		=	0.90	
ϕ Shea		=	0.85	
k_1		=	1.05	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0472	
ρ_{max}		=	0.0354	
A_s		=	79.680	[cm ²]
a		=	35.711	[cm]
M_u		=	163917	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	12.32	[cm ²]
ΣA_s		=	19.660	[cm ²]
No. of steel		=	4	
A_s		=	24.63	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.11	[cm]
ρf_y	=	77	[kg/cm ²]
Y'	=	30.1	
I	=	880975	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	1.01	[cm]
Δ_{Time}	=	1.76	[cm]

Δ_{all} OK

Δ_{all} OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

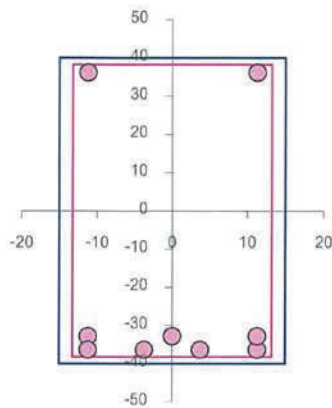
Beam Code B-13

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

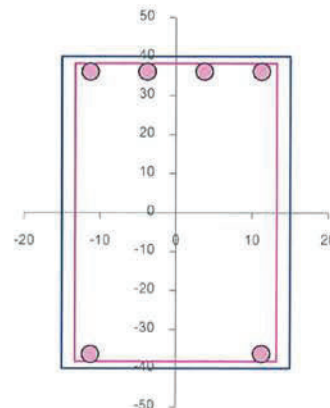
Engineer CKJ

Date 7 Jan 21



Positive Section

B-13 (30 X 80)



Negative Section

B-13 (30 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

Beam Code **5TB-1**

Project **อาคารทิศตะวันตก โซน ซี**

File Name **Beam**

Engineer **CKJ**

Date **15 Oct 20**

	f_c'	=	350	[kg/cm ²]
	f_y SD	=	5000	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$	M_u^+	=	4923200	[kg-m]
$M_{neg.}$	M_u^-	=	2215440	[kg-m]
$V_{max.}$	V_u	=	685800	[kg]
	DL	=	15500	[kg/m]
	LL	=	2100	[kg/m]
Length	L_n	=	1600	[cm]
width	b	=	140	[cm]
depth	t	=	240	[cm]
	d'	=	20	[cm]
siding	d''	=	5	[cm]

For Positive Moment :

Upper Steel	DB32	▼
Lower Steel	DB32	▼
Stirrup Steel	DB16	▼

	d	=	220	[cm]
	a_{try}	=	71.2303	[cm]
	A_s	=	593.348	[cm ²]
	a	=	71.2303	[cm]
ϕ Bend		=	0.90	
ϕ Shea		=	0.85	
k_1		=	0.80	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
p		=	0.0262	
p_{max}		=	0.0196	
A_s		=	605.020	[cm ²]
a		=	72.631	[cm]
M_u		=	5000970	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	16.08	[cm ²]
ΣA_s		=	593.348	[cm ²]
No. of steel		=	74	
A_s		=	595.14	[cm ²]

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	274855	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	527.5	[cm]
S	=	29.278	[cm]

Used Stirrup **4 DB16 @ 0.250** **OK**



For Negative Moment :

Upper Steel	DB32	▼
Lower Steel	DB32	▼
Stirrup Steel	DB16	▼

	d	=	220	[cm]
	a_{try}	=	8.7110	[cm]
	A_s	=	228.302	[cm ²]
	a	=	27.4072	[cm]
ϕ Bend		=	0.90	
ϕ Shea		=	0.85	
k_1		=	1.05	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
p		=	0.0344	
p_{max}		=	0.0258	
A_s		=	794.089	[cm ²]
a		=	95.329	[cm]
M_u		=	6158240	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	16.08	[cm ²]
ΣA_s		=	228.302	[cm ²]
No. of steel		=	29	
A_s		=	233.23	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	4.44	[cm]
ρf_y	=	97	[kg/cm ²]
Y'	=	88.5	
I	=	104386750	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.51	[cm]
Δ_{Time}	=	0.94	[cm]

OK

OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318-89

Design Reinforced Concrete Beam

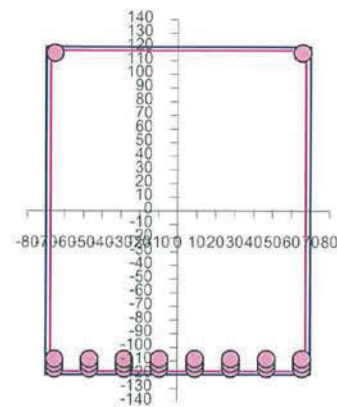
Beam Code **5TB-1**

Project อาคารทิศตะวันตก โซน ซี

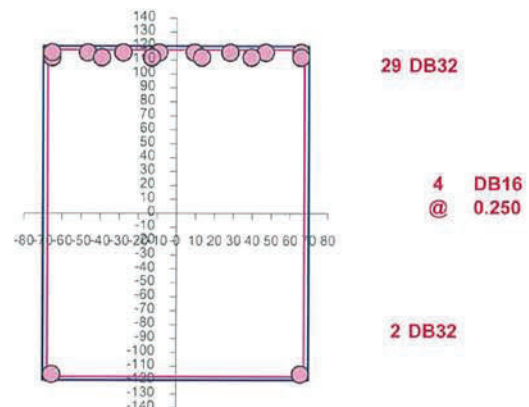
File Name Beam

Engineer CKJ

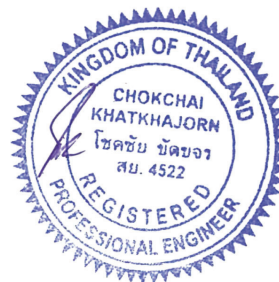
Date 15 Oct 20



Positive Section
5TB-1 (140 X 240)



Negative Section
5TB-1 (140 X 240)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **4B-1**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **15-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ μ_u	=	0	[kg-m]
$M_{neg.}$ μ_u	=	56581	[kg-m]
$V_{max.}$ V_u	=	43524	[kg]
DL	=	12455	[kg/m]
LL	=	4285	[kg/m]
Length L_n	=	260	[cm]
width b	=	80	[cm]
depth t	=	60	[cm]
siding d'	=	10	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	50	[cm]
a_{try}	=	0.0000	[cm]
A_s	=	0.000	[cm ²]
a	=	0.0000	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	107.926	[cm ²]
a	=	18.139	[cm]
μ_u	=	159029	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	0.000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	35695	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	39.4	[cm]
S	=	16.578	[cm]
Used Stirrup	=	2 RB 9 @ 0.150	

OK



For Negative Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	50	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	31.434	[cm ²]
a	=	0.0000	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	141.653	[cm ²]
a	=	23.807	[cm]
μ_u	=	194272	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	31.434	[cm ²]
No. of steel	=	7	
A_s	=	34.36	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	0.72	[cm]
ρf_y	=	10	[kg/cm ²]
Y'	=	8.45	
I	=	833333	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.04	[cm]
Δ_{Time}	=	0.03	

Δ_{all} **OK**

Δ_{all} **OK**

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **4B-1**

Project : **อาคารทิศตะวันตก**

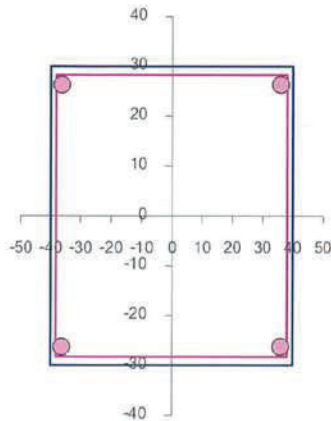
Job No. **193018**

Rev. **1**

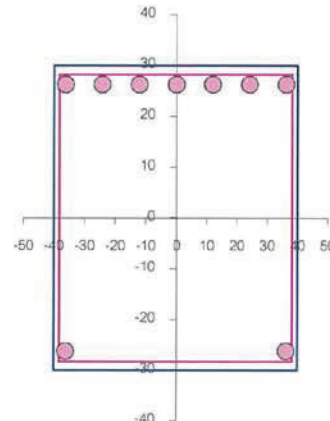
Initial **CKJ**

Date **15-Oct-20**

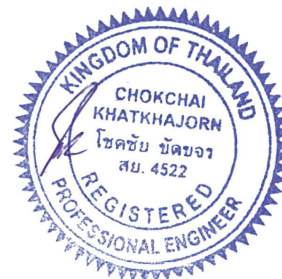
File **Beam B**



Positive Section
4B-1 (80 X 60)



Negative Section
4B-1 (80 X 60)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **4B-2**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **15-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	45760	[kg-m]
$M_{neg.}$ M_u^-	=	56581	[kg-m]
$V_{max.}$ V_u	=	43524	[kg]
DL	=	4700	[kg/m]
LL	=	1020	[kg/m]
Length L_n	=	800	[cm]
width b	=	80	[cm]
depth t	=	60	[cm]
siding d'	=	7.5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	52.5	[cm]
a_{try}	=	4.2403	[cm]
A_s	=	25.231	[cm ²]
a	=	4.2404	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	113.322	[cm ²]
a	=	19.046	[cm]
M_u	=	175329	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	25.231	[cm ²]
No. of steel	=	6	
A_s	=	29.45	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	37480	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	107.2	[cm]
S	=	22.547	[cm]

Used Stirrup: 2 RB 9 @ 0.225 **OK**



For Negative Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	52.5	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	31.197	[cm ²]
a	=	4.2404	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	148.735	[cm ²]
a	=	24.998	[cm]
M_u	=	214185	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	31.197	[cm ²]
No. of steel	=	7	
A_s	=	34.36	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.22	[cm]
ρf_y	=	28	[kg/cm ²]
Y'	=	14.1	
I	=	964688	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	1.11	[cm]
Δ_{Time}	=	1.99	[cm]

Δ_{all} **OK**

Δ_{all} **OK**

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318-89)

Beam No. **4B-2**

Project : **อาคารทิศตะวันตก**

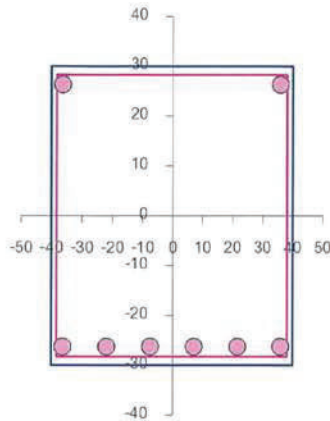
Job No. **193018**

Rev. **1**

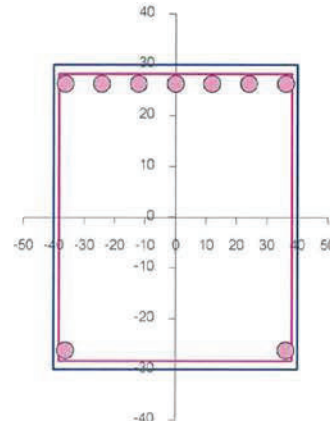
Initial **CKJ**

Date **15-Oct-20**

File **Beam B**



Positive Section
4B-2 (80 X 60)



Negative Section
4B-2 (80 X 60)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **RB-1**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	4000	[kg/cm ²]
$M_{pos.}$ Mu ⁺	=	19072	[kg-m]
$M_{neg.}$ Mu ⁻	=	19072	[kg-m]
$V_{max.}$ Vu	=	11900	[kg]
DL	=	2300	[kg/m]
LL	=	680	[kg/m]
Length Ln	=	500	[cm]
width b	=	190	[cm]
depth t	=	35	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 12	▼

d	=	30	[cm]
a try	=	1.2768	[cm]
As	=	18.043	[cm ²]
a	=	1.2768	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	153.794	[cm ²]
a	=	10.883	[cm]
Mu	=	135970	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]
Σ As	=	18.043	[cm ²]
No. of steel	=	6	
As	=	18.85	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	50866	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-658.3	[cm]
S	=	-5.921	[cm]

Used Stirrup **RB 12 @ #N/A**

#N/A



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 12	▼

d	=	30	[cm]
a try	=	8.7110	[cm]
As	=	18.043	[cm ²]
a	=	1.2768	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	201.855	[cm ²]
a	=	14.284	[cm]
Mu	=	166103	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]
Σ As	=	18.043	[cm ²]
No. of steel	=	6	
As	=	18.85	[cm ²]

Section OK

Check Deflection

Δ _{all}	=	1.39	[cm]
ρ _{fy}	=	13	< 35 [kg/cm ²]
Y'	=	5.8	
I	=	427500	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.20	[cm] < Δ _{all} OK
Δ _{Time}	=	0.34	< Δ _{all} OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **RB-1**

Project : **อาคารทิศตะวันตก**

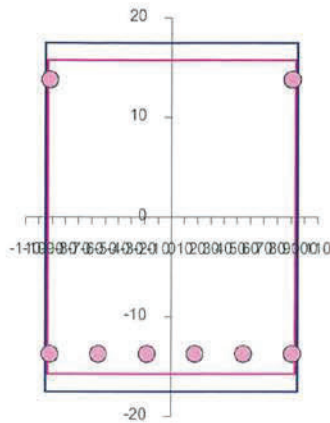
Job No. **193018**

Rev. **1**

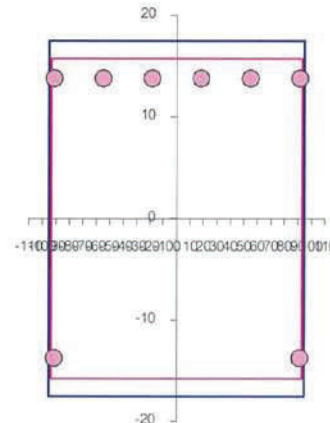
Initial **CKJ**

Date **05-Oct-20**

File **Beam B**



Positive Section
RB-1 (190 X 35)



Negative Section
RB-1 (190 X 35)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **RB-1A**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	4000	[kg/cm ²]
$M_{pos.}$ Mu ⁺	=	7200	[kg-m]
$M_{neg.}$ Mu ⁻	=	7200	[kg-m]
$V_{max.}$ Vu	=	9000	[kg]
DL	=	3070	[kg/m]
LL	=	1430	[kg/m]
Length Ln	=	400	[cm]
width b	=	190	[cm]
depth t	=	30	[cm]
siding d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 12	▼

d	=	25	[cm]
a try	=	0.5726	[cm]
As	=	8.093	[cm ²]
a	=	0.5727	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρmax	=	0.0270	
As	=	128.162	[cm ²]
a	=	9.069	[cm]
Mu	=	94423	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	4.02	[cm ²]
Σ As	=	8.093	[cm ²]
No. of steel	=	5	
As	=	10.05	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	42388	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-600.7	[cm]
S	=	-5.758	[cm]

Used Stirrup **RB 12 @ #N/A**

#N/A



For Negative Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 12	▼

d	=	25	[cm]
a try	=	8.7110	[cm]
As	=	8.093	[cm ²]
a	=	0.5727	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρmax	=	0.0354	
As	=	168.212	[cm ²]
a	=	11.904	[cm]
Mu	=	115349	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	4.02	[cm ²]
Σ As	=	8.093	[cm ²]
No. of steel	=	5	
As	=	10.05	[cm ²]

Section OK

Check Deflection

Δ all	=	1.11	[cm]
ρ fy	=	8	[kg/cm ²]
Y'	=	3.95	
I	=	247396	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.21	[cm]
Δ Time	=	0.35	



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **RB-1A**

Project : **อาคารทิศตะวันตก**

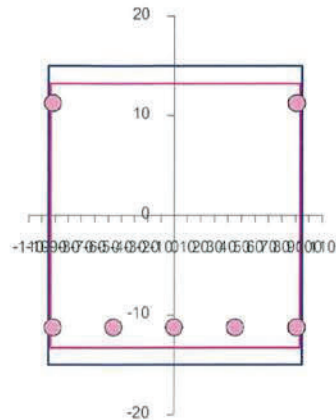
Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

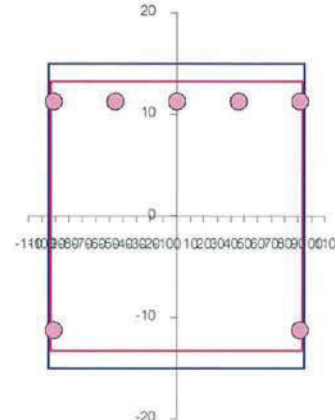


Positive Section
RB-1A (190 X 30)

2 DB 16

**Stirrup RB 12
@ #N/A**

5 DB 16



Negative Section
RB-1A (190 X 30)

5 DB 16

**Stirrup RB 12
@ #N/A**

2 DB 16



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **RB-2**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	4000	[kg/cm ²]
$M_{pos.}$ μ_u^+	=	38102	[kg-m]
$M_{neg.}$ μ_u^-	=	38102	[kg-m]
$V_{max.}$ V_u	=	22680	[kg]
DL	=	4040	[kg/m]
LL	=	1360	[kg/m]
Length L_n	=	540	[cm]
width b	=	300	[cm]
depth t	=	35	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 12	▼

d	=	30	[cm]
a_{try}	=	1.6251	[cm]
A_s	=	36.262	[cm ²]
a	=	1.6252	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	242.833	[cm ²]
a	=	10.883	[cm]
μ_u	=	214689	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	36.262	[cm ²]
No. of steel	=	12	
A_s	=	37.70	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	80315	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-542.7	[cm]
S	=	-4.003	[cm]

Used Stirrup **RB 12 @ #N/A**

#N/A



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 12	▼

d	=	30	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	36.262	[cm ²]
a	=	1.6252	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	318.718	[cm ²]
a	=	14.284	[cm]
μ_u	=	262268	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	36.262	[cm ²]
No. of steel	=	12	
A_s	=	37.70	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.50	[cm]
ρf_y	=	17	[kg/cm ²]
Y'	=	6.44	
I	=	675000	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.31	[cm]
Δ_{Time}	=	0.53	[cm]

Δ_{all} **OK**

Δ_{all} **OK**

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **RB-2**

Project : **อาคารทิศตะวันตก**

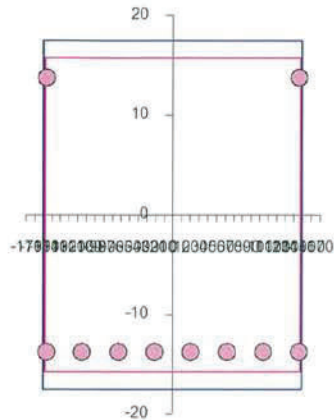
Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

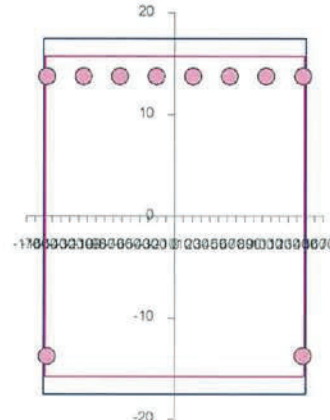


Positive Section
RB-2 (300 X 35)

2 DB 20

**Stirrup RB 12
@ #N/A**

12 DB 20



Negative Section
RB-2 (300 X 35)

12 DB 20

**Stirrup RB 12
@ #N/A**

2 DB 20



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **RB-2A**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	4000	[kg/cm ²]
$M_{pos.}$ Mu ⁺	=	13760	[kg-m]
$M_{neg.}$ Mu ⁻	=	13760	[kg-m]
$V_{max.}$ Vu	=	17200	[kg]
DL	=	5750	[kg/m]
LL	=	2850	[kg/m]
Length Ln	=	400	[cm]
width b	=	300	[cm]
depth t	=	30	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 12	▼

d	=	25	[cm]
a try	=	0.6948	[cm]
As	=	15.504	[cm ²]
a	=	0.6949	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
pmax	=	0.0270	
As	=	202.361	[cm ²]
a	=	9.069	[cm]
Mu	=	149089	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]
Σ As	=	15.504	[cm ²]
No. of steel	=	5	
As	=	15.71	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	66929	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-461.5	[cm]
S	=	-3.866	[cm]

Used Stirrup **RB 12 @ #N/A**

#N/A



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 12	▼

d	=	25	[cm]
a try	=	8.7110	[cm]
As	=	15.504	[cm ²]
a	=	0.6949	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
pmax	=	0.0354	
As	=	265.598	[cm ²]
a	=	11.904	[cm]
Mu	=	182130	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	6.28	[cm ²]
Σ As	=	15.504	[cm ²]
No. of steel	=	5	
As	=	15.71	[cm ²]

Section OK

Check Deflection

Δ all	=	1.11	[cm]
ρ fy	=	8	[kg/cm ²]
Y'	=	3.93	
I	=	390625	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.26	[cm]
Δ Time	=	0.41	

Δ all **OK**

Δ all **OK**

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **RB-2A**

Project : **อาคารทิศตะวันตก**

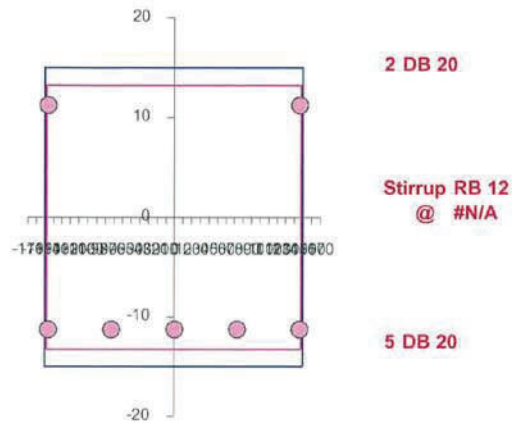
Job No. **193018**

Rev. **1**

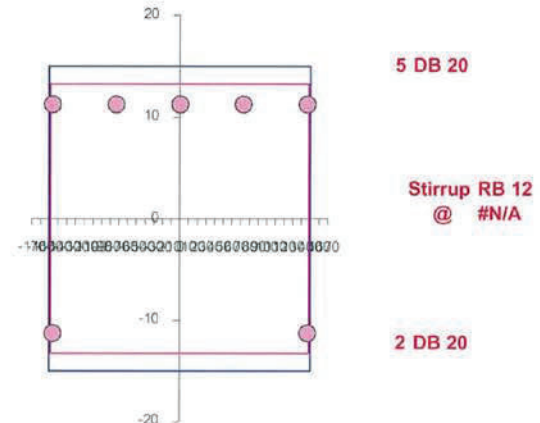
Initial **CKJ**

Date **05-Oct-20**

File **Beam B**



Positive Section
RB-2A (300 X 30)



Negative Section
RB-2A (300 X 30)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **BDB-1**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 7 Oct 20

	f_c'	=	350	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$	M_u^+	=	94903	[kg-m]
$M_{neg.}$	M_u^-	=	94903	[kg-m]
$V_{max.}$	V_u	=	56490	[kg]
	DL	=	5740	[kg/m]
	LL	=	7710	[kg/m]
Length	L_n	=	540	[cm]
width	b	=	300	[cm]
depth	t	=	45	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

	d	=	40	[cm]
	a_{try}	=	3.0716	[cm]
	A_s	=	68.536	[cm ²]
	a	=	3.0717	[cm]
ϕ Bend		=	0.90	
ϕ Shea		=	0.85	
k_1		=	0.80	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0360	
ρ_{max}		=	0.0270	
A_s		=	323.777	[cm ²]
a		=	14.511	[cm]
M_u		=	381669	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	9.82	[cm ²]
ΣA_s		=	68.536	[cm ²]
No. of steel		=	14	
A_s		=	68.72	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	107086	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-165.1	[cm]
S	=	-24.320	[cm]

Used Stirrup 4 DB12 @ #N/A #N/A



For Negative Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

	d	=	40	[cm]
	a_{try}	=	8.7110	[cm]
	A_s	=	73.958	[cm ²]
	a	=	3.3146	[cm]
ϕ Bend		=	0.90	
ϕ Shea		=	0.85	
k_1		=	1.05	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0472	
ρ_{max}		=	0.0354	
A_s		=	424.958	[cm ²]
a		=	19.046	[cm]
M_u		=	466254	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	9.82	[cm ²]
ΣA_s		=	73.958	[cm ²]
No. of steel		=	16	
A_s		=	78.54	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.50	[cm]
ρf_y	=	23	[kg/cm ²]
Y'	=	9.84	
I	=	1600000	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.33	[cm]
Δ_{Time}	=	0.43	

Δ_{all} OK
 Δ_{all} OK



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

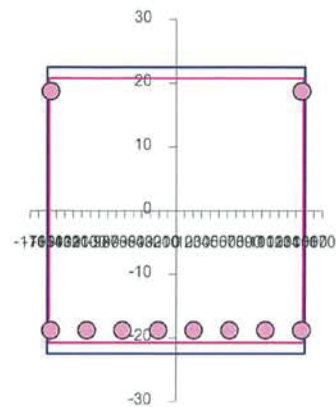
Beam Code **BDB-1**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 7 Oct 20

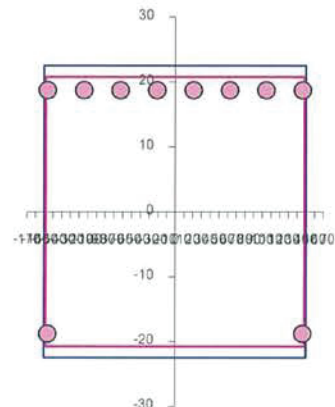


Positive Section
BDB-1 (300 X 45)

2 DB25

4 DB12
@ #N/A

14 DB25



Negative Section
BDB-1 (300 X 45)

16 DB25

4 DB12
@ #N/A

2 DB25



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **BDB-2**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **07-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
M _{pos.} Mu ⁺	=	59170	[kg-m]
M _{neg.} Mu ⁻	=	0	[kg-m]
V _{max.} Vu	=	33865	[kg]
DL	=	5480	[kg/m]
LL	=	5520	[kg/m]
Length Ln	=	650	[cm]
width b	=	150	[cm]
depth t	=	45	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	40	[cm]
a try	=	3.8697	[cm]
As	=	43.179	[cm ²]
a	=	3.8704	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p _{max}	=	0.0270	
As	=	161.889	[cm ²]
a	=	14.511	[cm]
Mu	=	190835	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	9.82	[cm ²]
Σ As	=	43.179	[cm ²]
No. of steel	=	9	
As	=	44.18	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} bd$	=	53543	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-111.8	[cm]
S	=	-5.276	[cm]

Used Stirrup: 2 RB 9 @ #N/A **#N/A**



For Negative Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	40	[cm]
a try	=	8.7110	[cm]
As	=	0.000	[cm ²]
a	=	3.8704	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p _{max}	=	0.0354	
As	=	212.479	[cm ²]
a	=	19.046	[cm]
Mu	=	233127	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	9.82	[cm ²]
Σ As	=	0.000	[cm ²]
No. of steel	=	2	
As	=	9.82	[cm ²]

Section OK

Check Deflection

Δ _{all}	=	1.81	[cm]
p fy	=	29	< 35 [kg/cm ²]
Y'	=	10.9	
I	=	800000	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	1.12	[cm] < Δ _{all} OK
Δ Time	=	1.57	< Δ _{all} OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง
(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)
(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **BDB-2**

Project : **อาคารทิศตะวันตก**

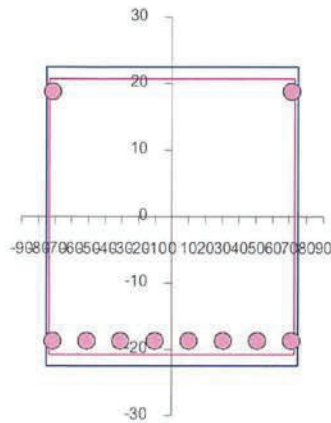
Job No. **193018**

Rev. **1**

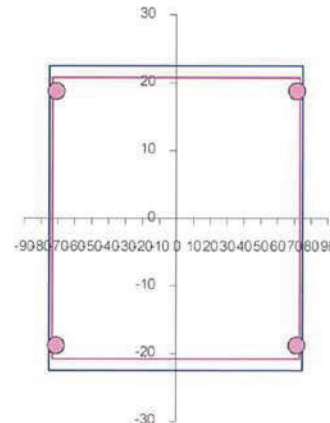
Initial **CKJ**

Date **07-Oct-20**

File **Beam B**



Positive Section
BDB-2 (150 X 45)



Negative Section
BDB-2 (150 X 45)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **BDB-3**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **08-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ μ_u	=	46670	[kg-m]
$M_{neg.}$ μ_u	=	46670	[kg-m]
$V_{max.}$ V_u	=	34400	[kg]
DL	=	4100	[kg/m]
LL	=	5100	[kg/m]
Length L_n	=	500	[cm]
width b	=	200	[cm]
depth t	=	45	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 12	▼

d	=	40	[cm]
a_{try}	=	2.2416	[cm]
A_s	=	33.344	[cm ²]
a	=	2.2416	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	215.851	[cm ²]
a	=	14.511	[cm]
μ_u	=	254446	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	33.344	[cm ²]
No. of steel	=	11	
A_s	=	34.56	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	71391	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-191.0	[cm]
S	=	-4.990	[cm]

Used Stirrup: 3 RB 12 @ #N/A

#N/A



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 12	▼

d	=	40	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	33.344	[cm ²]
a	=	2.2416	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	283.305	[cm ²]
a	=	19.046	[cm]
μ_u	=	310836	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	33.344	[cm ²]
No. of steel	=	11	
A_s	=	34.56	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.39	[cm]
ρf_y	=	17	[kg/cm ²]
Y'	=	8.7	
I	=	1066667	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.25	[cm]
Δ_{Time}	=	0.33	

Δ_{all} OK

Δ_{all} OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **BDB-3**

Project : **อาคารทิศตะวันตก**

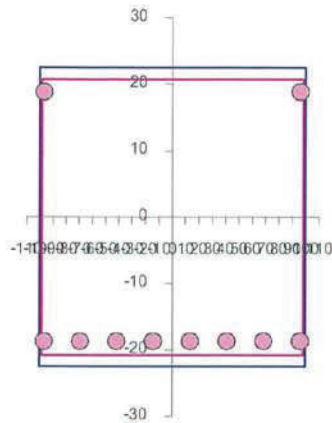
Job No. **193018**

Rev. **1**

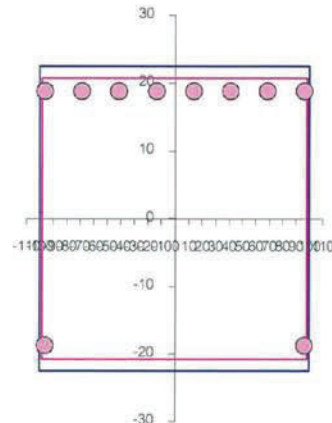
Initial **CKJ**

Date **08-Oct-20**

File **Beam B**



Positive Section
BDB-3 (200 X 45)



Negative Section
BDB-3 (200 X 45)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **BDB-4**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 7 Oct 20

	f_c'	=	350	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$	M_u^+	=	48000	[kg-m]
$M_{neg.}$	M_u^-	=	48000	[kg-m]
$V_{max.}$	V_u	=	24000	[kg]
	DL	=	5260	[kg/m]
	LL	=	5000	[kg/m]
Length	L_n	=	800	[cm]
width	b	=	250	[cm]
depth	t	=	45	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

	d	=	40	[cm]
	a_{try}	=	1.8347	[cm]
	A_s	=	34.116	[cm ²]
	a	=	1.8348	[cm]
ϕ Bend		=	0.90	
ϕ Shea		=	0.85	
k_1		=	0.80	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0360	
ρ_{max}		=	0.0270	
A_s		=	269.814	[cm ²]
a		=	14.511	[cm]
M_u		=	318058	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	9.82	[cm ²]
ΣA_s		=	34.116	[cm ²]
No. of steel		=	7	
A_s		=	34.36	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	89239	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-864.2	[cm]
S	=	-18.862	[cm]

Used Stirrup 4 DB12 @ #N/A #N/A



For Negative Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

	d	=	40	[cm]
	a_{try}	=	8.7110	[cm]
	A_s	=	37.406	[cm ²]
	a	=	2.0118	[cm]
ϕ Bend		=	0.90	
ϕ Shea		=	0.85	
k_1		=	1.05	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0472	
ρ_{max}		=	0.0354	
A_s		=	354.131	[cm ²]
a		=	19.046	[cm]
M_u		=	388545	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	9.82	[cm ²]
ΣA_s		=	37.406	[cm ²]
No. of steel		=	8	
A_s		=	39.27	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.22	[cm]
ρf_y	=	14	[kg/cm ²]
Y'	=	7.86	
I	=	1333333	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	1.44	[cm]
Δ_{Time}	=	2.04	[cm]



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

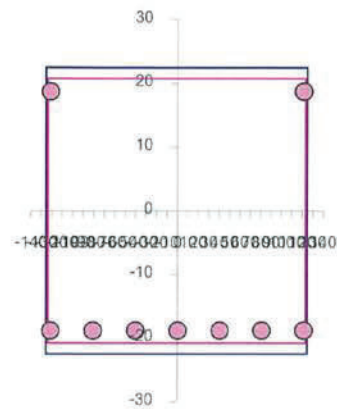
Beam Code **BDB-4**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 7 Oct 20

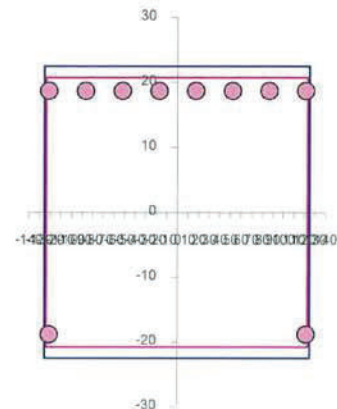


Positive Section
BDB-4 (250 X 45)

2 DB25

4 DB12
@ #N/A

7 DB25



Negative Section
BDB-4 (250 X 45)

8 DB25

4 DB12
@ #N/A

2 DB25



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **BDB-4A**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 21 Oct 20

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	48000	[kg-m]
M _{neg.}	Mu ⁻	=	48000	[kg-m]
V _{max.}	Vu	=	24000	[kg]
	DL	=	5260	[kg/m]
	LL	=	5000	[kg/m]
Length	Ln	=	800	[cm]
width	b	=	400	[cm]
depth	t	=	45	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB20	▼
Lower Steel	DB20	▼
Stirrup Steel	DB12	▼

	d	=	40	[cm]
	a try	=	1.1366	[cm]
	As	=	33.814	[cm ²]
	a	=	1.1366	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	0.80		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0360		
p _{max}	=	0.0270		
As	=	431.703	[cm ²]	
a	=	14.511	[cm]	
Mu	=	508892	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	6.28	[cm ²]	
Σ As	=	33.814	[cm ²]	
No. of steel	=	11		
As	=	34.56	[cm ²]	

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	142782	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	-1622.7	[cm]
S	=	-10.359	[cm]

Used Stirrup 4 DB12 @ #N/A

#N/A



For Negative Moment :

Upper Steel	DB20	▼
Lower Steel	DB20	▼
Stirrup Steel	DB12	▼

	d	=	40	[cm]
	a try	=	8.7110	[cm]
	As	=	37.406	[cm ²]
	a	=	1.2574	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	1.05		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0472		
p _{max}	=	0.0354		
As	=	566.610	[cm ²]	
a	=	19.046	[cm]	
Mu	=	621672	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	6.28	[cm ²]	
Σ As	=	37.406	[cm ²]	
No. of steel	=	12		
As	=	37.70	[cm ²]	

Section OK

Check Deflection

Δ all	=	2.22	[cm]	
ρ fy	=	9	<	35 [kg/cm ²]
Y'	=	6.38		
I	=	2133333	[cm ⁴]	
Ec	=	284116	[kg/cm ²]	
Δ	=	0.90	[cm]	< Δ all OK
Δ Time	=	1.28	<	Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

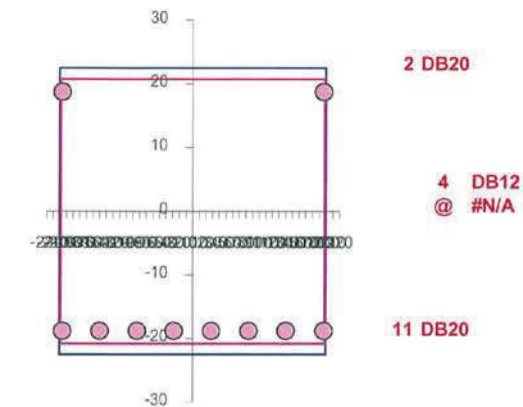
Beam Code **BDB-4A**

Project อาคารทิศตะวันตก โซน ซี

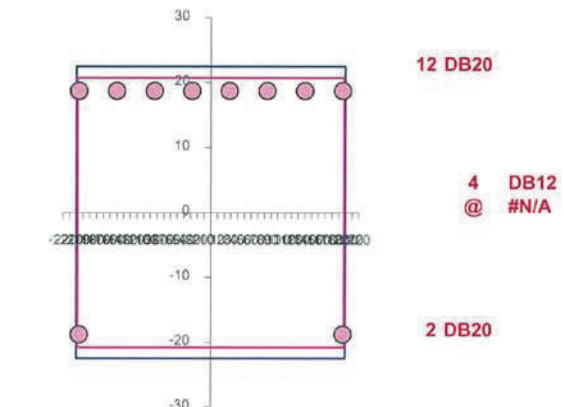
File Name Beam

Engineer **CKJ**

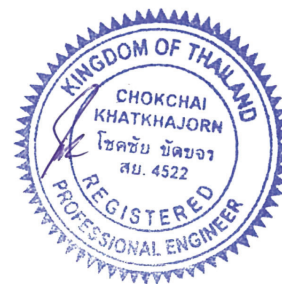
Date 21 Oct 20



Positive Section
BDB-4A (400 X 45)



Negative Section
BDB-4A (400 X 45)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **BDB-5**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 21 Oct 20

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$ μ_u^+	=	48000	[kg-m]
$M_{neg.}$ μ_u^-	=	48000	[kg-m]
$V_{max.}$ V_u	=	24000	[kg]
DL	=	5260	[kg/m]
LL	=	5000	[kg/m]
Length L_n	=	800	[cm]
width b	=	260	[cm]
depth t	=	45	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB20	▼
Lower Steel	DB20	▼
Stirrup Steel	DB12	▼

d	=	40	[cm]
a_{try}	=	1.7626	[cm]
A_s	=	34.084	[cm ²]
a	=	1.7626	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p_{max}	=	0.0270	
A_s	=	280.607	[cm ²]
a	=	14.511	[cm]
μ_u	=	330780	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	34.084	[cm ²]
No. of steel	=	11	
A_s	=	34.56	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	92808	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-914.8	[cm]
S	=	-17.883	[cm]

Used Stirrup 4 DB12 @ #N/A **#N/A**



For Negative Moment :

Upper Steel	DB20	▼
Lower Steel	DB20	▼
Stirrup Steel	DB12	▼

d	=	40	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	37.406	[cm ²]
a	=	1.9344	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p_{max}	=	0.0354	
A_s	=	368.297	[cm ²]
a	=	19.046	[cm]
μ_u	=	404087	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	37.406	[cm ²]
No. of steel	=	12	
A_s	=	37.70	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.22	[cm]
ρf_y	=	13	[kg/cm ²]
Y'	=	7.75	
I	=	1386667	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	1.39	[cm]
Δ_{Time}	=	1.97	[cm]

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

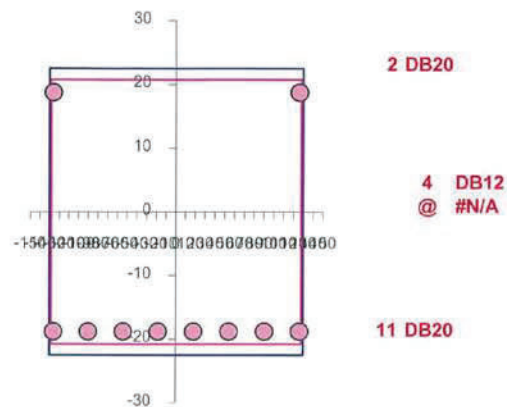
Beam Code **BDB-5**

Project อาคารทิศตะวันตก โซน ซี

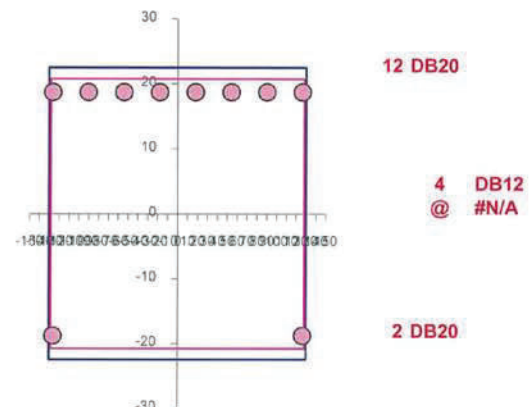
File Name Beam

Engineer **CKJ**

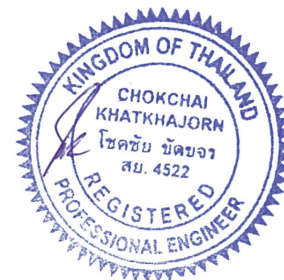
Date 21 Oct 20



Positive Section
BDB-5 (260 X 45)



Negative Section
BDB-5 (260 X 45)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DWB**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 21 Oct 20

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$ μ	=	128000	[kg-m]
$M_{neg.}$ μ	=	128000	[kg-m]
$V_{max.}$ μ	=	64000	[kg]
DL	=	3200	[kg/m]
LL	=	4800	[kg/m]
Length L_n	=	800	[cm]
width b	=	25	[cm]
depth t	=	280	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	275	[cm]
a_{try}	=	7.0438	[cm]
A_s	=	13.097	[cm ²]
a	=	7.0438	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p_{max}	=	0.0270	
A_s	=	185.497	[cm ²]
a	=	99.763	[cm]
μ	=	1503319	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]
ΣA_s	=	13.097	[cm ²]
No. of steel	=	3	
A_s	=	18.47	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	61351	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	74.1	[cm]
S	=	137.500	[cm]
Used Stirrup	1	DB12 @ 0.400	

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	275	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	13.137	[cm ²]
a	=	7.0655	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p_{max}	=	0.0354	
A_s	=	243.465	[cm ²]
a	=	130.939	[cm]
μ	=	1836481	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]
ΣA_s	=	13.137	[cm ²]
No. of steel	=	3	
A_s	=	18.47	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.22	[cm]
ρf_y	=	11	< 35 [kg/cm ²]
Y'	=	48.4	
I	=	43326823	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.03	[cm] < Δ_{all} OK
Δ_{Time}	=	0.01	< Δ_{all} OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

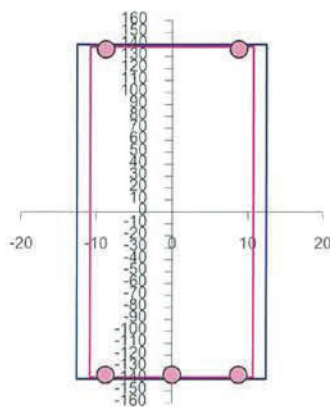
Beam Code **DWB**

Project อาคารทิศตะวันตก โซน ซี

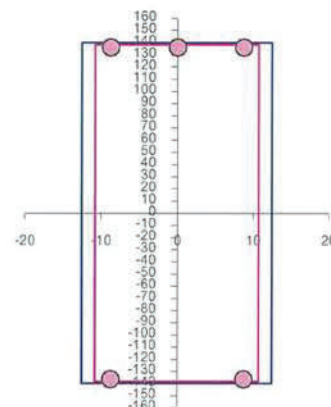
File Name Beam

Engineer **CKJ**

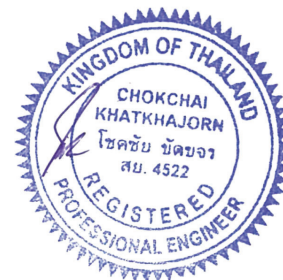
Date 21 Oct 20



Positive Section
DWB (25 X 280)



Negative Section
DWB (25 X 280)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **BT-1**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **08-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	10000	[kg-m]
$M_{neg.}$ M_u^-	=	10000	[kg-m]
$V_{max.}$ V_u	=	5000	[kg]
DL	=	2000	[kg/m]
LL	=	2000	[kg/m]
Length L_n	=	540	[cm]
width b	=	40	[cm]
depth t	=	45	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	40	[cm]
a_{try}	=	2.4065	[cm]
A_s	=	7.160	[cm ²]
a	=	2.4067	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	43.170	[cm ²]
a	=	14.511	[cm]
M_u	=	50889	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]
ΣA_s	=	7.160	[cm ²]
No. of steel	=	4	
A_s	=	8.04	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	14278	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-385.4	[cm]
S	=	-11.190	[cm]

Used Stirrup **RB 9 @ #N/A** **#N/A**



For Negative Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	40	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	7.160	[cm ²]
a	=	2.4067	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	56.661	[cm ²]
a	=	19.046	[cm]
M_u	=	62167	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]
ΣA_s	=	7.160	[cm ²]
No. of steel	=	4	
A_s	=	8.04	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.50	[cm]
ρf_y	=	20	[kg/cm ²]
γ'	=	9.3	
I	=	213333	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.73	[cm]
Δ_{Time}	=	0.41	[cm]

OK
OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **BT-1**

Project : **อาคารทิศตะวันตก**

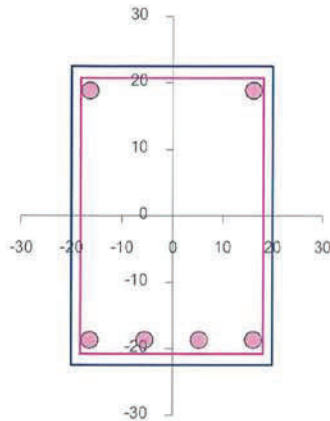
Job No. **193018**

Rev. **1**

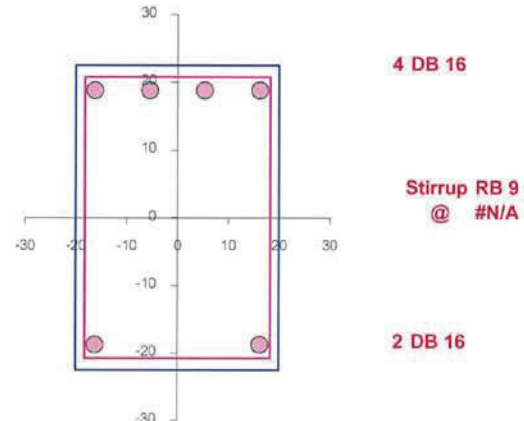
Initial **CKJ**

Date **08-Oct-20**

File **Beam B**



Positive Section
BT-1 (40 X 45)



Negative Section
BT-1 (40 X 45)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **RDB-1**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 8 Oct 20

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu*	=	0	[kg-m]
M _{neg.}	Mu*	=	97920	[kg-m]
V _{max.}	Vu	=	61200	[kg]
	DL	=	4600	[kg/m]
	LL	=	10700	[kg/m]
Length	Ln	=	800	[cm]
width	b	=	40	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d"	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	0.0000	[cm]
	As	=	0.000	[cm ²]
	a	=	0.0000	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	0.80		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0360		
p _{max}	=	0.0270		
As	=	80.944	[cm ²]	
a	=	27.208	[cm]	
Mu	=	178907	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	
Σ As	=	0.000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	26772	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	251.3	[cm]
S	=	33.507	[cm]

Used Stirrup **2** **DB12 @ 0.300** **OK**



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	8.7110	[cm]
	As	=	38.503	[cm ²]
	a	=	12.9421	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	1.05		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0472		
p _{max}	=	0.0354		
As	=	106.239	[cm ²]	
a	=	35.711	[cm]	
Mu	=	218556	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	
Σ As	=	38.503	[cm ²]	
No. of steel	=	7		
As	=	43.10	[cm ²]	

Section OK

Check Deflection

Δ all	=	2.22	[cm]	
p fy	=	16	<	35 [kg/cm ²]
Y'	=	16		
I	=	1406250	[cm ⁴]	
Ec	=	284116	[kg/cm ²]	
Δ	=	2.04	[cm]	< Δ all OK
Δ Time	=	0.95	<	Δ all OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

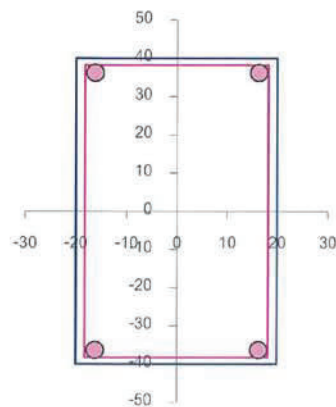
Beam Code RDB-1

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 8 Oct 20



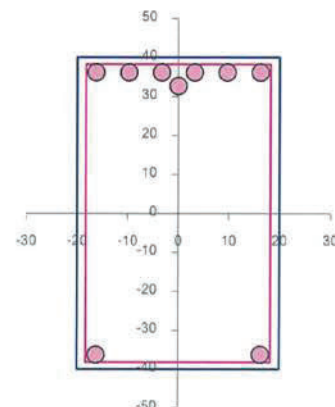
2 DB28

2 DB12
@ 0.300

2 DB28

Positive Section

RDB-1 (40 X 80)



7 DB28

2 DB12
@ 0.300

2 DB28

Negative Section

RDB-1 (40 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **RDB-2**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 8 Oct 20

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$ M_u^+	=	145977	[kg-m]
$M_{neg.}$ M_u^-	=	145977	[kg-m]
$V_{max.}$ V_u	=	51180	[kg]
DL	=	2225	[kg/m]
LL	=	2675	[kg/m]
Length L_n	=	840	[cm]
width b	=	25	[cm]
depth t	=	160	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	155	[cm]
a_{try}	=	14.7737	[cm]
A_s	=	27.470	[cm ²]
a	=	14.7737	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p_{max}	=	0.0270	
A_s	=	104.553	[cm ²]
a	=	56.230	[cm]
M_u	=	477583	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]
ΣA_s	=	27.470	[cm ²]
No. of steel	=	5	
A_s	=	30.79	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	34580	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	178.8	[cm]
S	=	71.810	[cm]

Used Stirrup 1 DB12 @ 0.400 OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	155	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	26.917	[cm ²]
a	=	14.4764	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p_{max}	=	0.0354	
A_s	=	137.226	[cm ²]
a	=	73.802	[cm]
M_u	=	583424	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]
ΣA_s	=	26.917	[cm ²]
No. of steel	=	5	
A_s	=	30.79	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.33	[cm]
p_{fy}	=	32	[kg/cm ²]
Y'	=	43.8	
I	=	7758073	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.14	[cm]
Δ_{Time}	=	0.19	[cm]



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

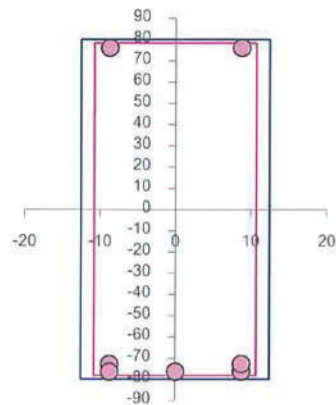
Beam Code **RDB-2**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 8 Oct 20



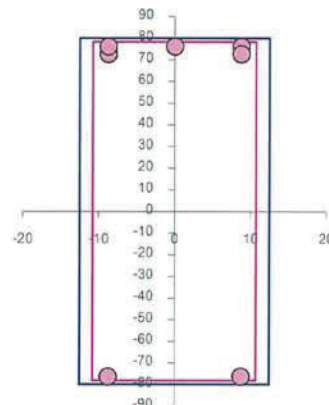
2 DB28

1 DB12
@ 0.400

5 DB28

Positive Section

RDB-2 (25 X 160)



5 DB28

1 DB12
@ 0.400

2 DB28

Negative Section

RDB-2 (25 X 160)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **RDB-3**

Project **อาคารทิศตะวันตก โซน ซี**

File Name **Beam**

Engineer **CKJ**

Date **8 Oct 20**

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	280334	[kg-m]
M _{neg.}	Mu ⁻	=	280334	[kg-m]
V _{max.}	Vu	=	95850	[kg]
	DL	=	2870	[kg/m]
	LL	=	5380	[kg/m]
Length	Ln	=	840	[cm]
width	b	=	80	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	20.1593	[cm]
	As	=	119.948	[cm ²]
	a	=	20.1593	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	0.80		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0360		
p _{max}	=	0.0270		
As	=	161.889	[cm ²]	
a	=	27.208	[cm]	
Mu	=	357815	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	
Σ As	=	119.948	[cm ²]	
No. of steel	=	20		
As	=	123.15	[cm ²]	

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	53543	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	220.6	[cm]
S	=	27.267	[cm]

Used Stirrup **2** **DB12 @ 0.250**

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	8.7110	[cm]
	As	=	110.229	[cm ²]
	a	=	18.5258	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	1.05		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0472		
p _{max}	=	0.0354		
As	=	212.479	[cm ²]	
a	=	35.711	[cm]	
Mu	=	437113	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	
Σ As	=	110.229	[cm ²]	
No. of steel	=	18		
As	=	110.84	[cm ²]	

Section OK

Check Deflection

Δ all	=	2.33	[cm]	
p fy	=	82	>	35 [kg/cm ²]
Y'	=	30.8		
I	=	2463284	[cm ⁴]	
Ec	=	284116	[kg/cm ²]	
Δ	=	0.76	[cm]	< Δ all OK
Δ Time	=	0.93	<	Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

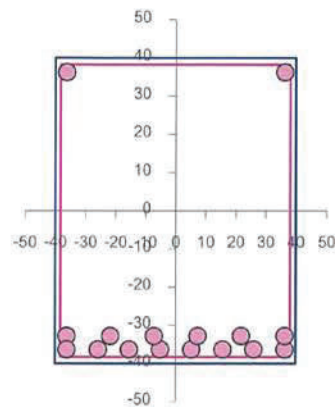
Beam Code **RDB-3**

Project อาคารทิศตะวันตก โซน ซี

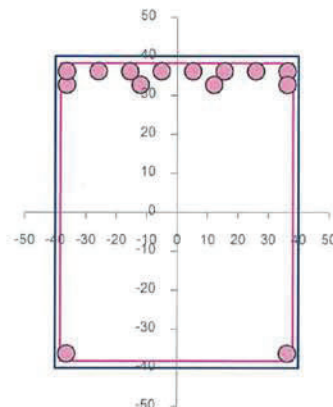
File Name Beam

Engineer **CKJ**

Date 8 Oct 20



Positive Section
RDB-3 (80 X 80)



Negative Section
RDB-3 (80 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-1**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	1565	[kg-m]
$M_{neg.}$ M_u^-	=	1565	[kg-m]
$V_{max.}$ V_u	=	2500	[kg]
DL	=	1200	[kg/m]
LL	=	800	[kg/m]
Length L_n	=	240	[cm]
width b	=	15	[cm]
depth t	=	30	[cm]
siding d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 12	▼
Lower Steel	DB 12	▼
Stirrup Steel	RB 9	▼

d	=	25	[cm]
a_{try}	=	1.6105	[cm]
A_s	=	1.797	[cm ²]
a	=	1.6105	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	10.118	[cm ²]
a	=	9.069	[cm]
M_u	=	7454	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	2.26	[cm ²]
ΣA_s	=	1.797	[cm ²]
No. of steel	=	2	
A_s	=	2.26	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	3346	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-16.5	[cm]
S	=	-76.661	[cm]

Used Stirrup **RB 9 @ #N/A** **#N/A**



For Negative Moment :

Upper Steel	DB 12	▼
Lower Steel	DB 12	▼
Stirrup Steel	RB 9	▼

d	=	25	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	1.797	[cm ²]
a	=	1.6105	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	13.280	[cm ²]
a	=	11.904	[cm]
M_u	=	9107	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	2.26	[cm ²]
ΣA_s	=	1.797	[cm ²]
No. of steel	=	2	
A_s	=	2.26	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	0.67	[cm]
ρf_y	=	24	[kg/cm ²]
Y'	=	6.29	
I	=	19531	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.16	[cm]
Δ_{Time}	=	0.09	

Δ_{all} **OK**

Δ_{all} **OK**

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-1**

Project : **อาคารทิศตะวันตก**

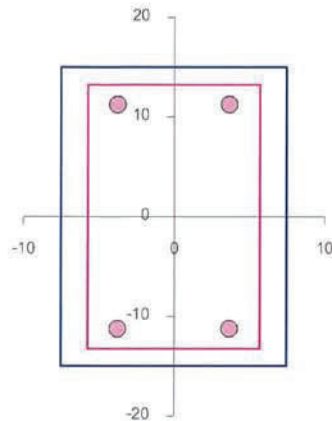
Job No. **193018**

Rev. **1**

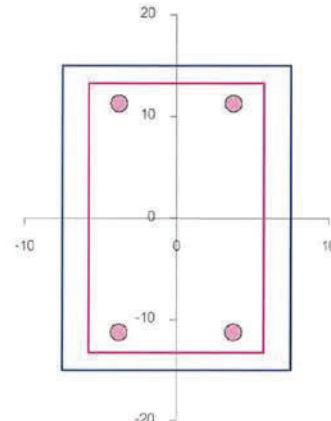
Initial **CKJ**

Date **05-Oct-20**

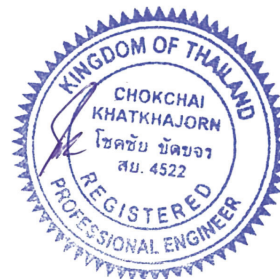
File **Beam B**



Positive Section
DB-1 (15 X 30)



Negative Section
DB-1 (15 X 30)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-2**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	4698	[kg-m]
$M_{neg.}$ M_u^-	=	4698	[kg-m]
$V_{max.}$ V_u	=	5220	[kg]
DL	=	1540	[kg/m]
LL	=	1360	[kg/m]
Length L_n	=	360	[cm]
width b	=	20	[cm]
depth t	=	40	[cm]
siding d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	35	[cm]
a_{try}	=	2.6034	[cm]
A_s	=	3.873	[cm ²]
a	=	2.6034	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	18.887	[cm ²]
a	=	12.697	[cm]
M_u	=	19481	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]
ΣA_s	=	3.873	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	6247	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-3.1	[cm]
S	=	-88.483	[cm]

Used Stirrup **RB 9 @ #N/A**

#N/A



For Negative Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	35	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	3.873	[cm ²]
a	=	2.6034	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	24.789	[cm ²]
a	=	16.665	[cm]
M_u	=	23798	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]
ΣA_s	=	3.873	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.00	[cm]
ρf_y	=	23	[kg/cm ²]
Y'	=	8.62	
I	=	71458	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.31	[cm]
Δ_{Time}	=	0.18	

Δ_{all} **OK**

Δ_{all} **OK**

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-2**

Project : **อาคารทิศตะวันตก**

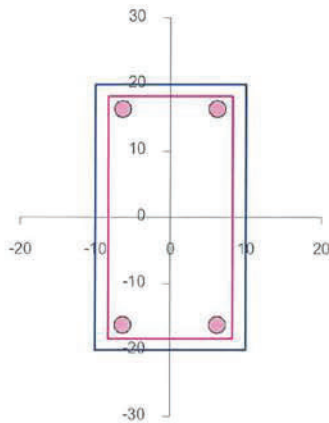
Job No. **193018**

Rev. **1**

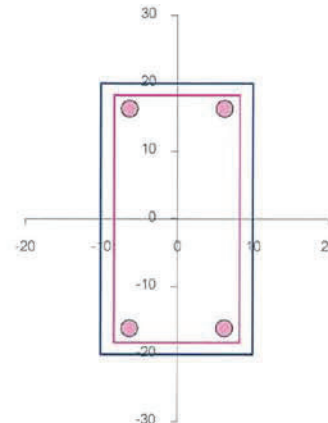
Initial **CKJ**

Date **05-Oct-20**

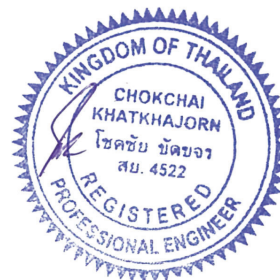
File **Beam B**



Positive Section
DB-2 (20 X 40)



Negative Section
DB-2 (20 X 40)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-2A**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	6000	[kg-m]
$M_{neg.}$ M_u^-	=	6000	[kg-m]
$V_{max.}$ V_u	=	6000	[kg]
DL	=	1600	[kg/m]
LL	=	1400	[kg/m]
Length L_n	=	400	[cm]
width b	=	20	[cm]
depth t	=	50	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	2.5629	[cm]
A_s	=	3.812	[cm ²]
a	=	2.5629	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	24.283	[cm ²]
a	=	16.325	[cm]
M_u	=	32203	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]
ΣA_s	=	3.812	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	8031	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-27.6	[cm]
S	=	-57.496	[cm]

Used Stirrup **RB 9 @ #N/A**

#N/A



For Negative Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	3.812	[cm ²]
a	=	2.5629	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	31.872	[cm ²]
a	=	21.426	[cm]
M_u	=	39340	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]
ΣA_s	=	3.812	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.11	[cm]
ρf_y	=	18	[kg/cm ²]
Y'	=	9.93	
I	=	151875	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.23	[cm]
Δ_{Time}	=	0.13	



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-2A**

Project : **อาคารทิศตะวันตก**

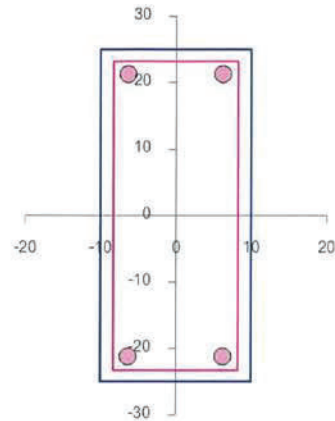
Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

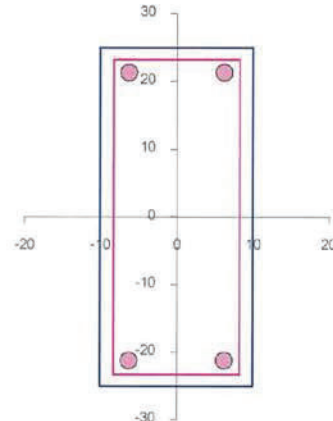


Positive Section
DB-2A (20 X 50)

2 DB 16

Stirrup RB 9
@ #N/A

2 DB 16

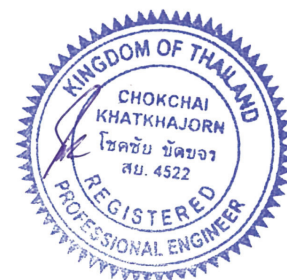


Negative Section
DB-2A (20 X 50)

2 DB 16

Stirrup RB 9
@ #N/A

2 DB 16



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-3**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **13-Jan-21**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ μ_u^+	=	13475	[kg-m]
$M_{neg.}$ μ_u^-	=	11000	[kg-m]
$V_{max.}$ V_u	=	15400	[kg]
DL	=	2800	[kg/m]
LL	=	6000	[kg/m]
Length L_n	=	350	[cm]
width b	=	30	[cm]
depth t	=	50	[cm]
siding d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	3.8965	[cm]
A_s	=	8.694	[cm ²]
a	=	3.8966	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	36.425	[cm ²]
a	=	16.325	[cm]
μ_u	=	48305	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	8.694	[cm ²]
No. of steel	=	3	
A_s	=	9.42	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	12047	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	58.6	[cm]
S	=	22.500	[cm]

Used Stirrup **RB 9 @ 0.225**

OK



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	7.097	[cm ²]
a	=	3.8966	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	47.808	[cm ²]
a	=	21.426	[cm]
μ_u	=	59010	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	7.097	[cm ²]
No. of steel	=	3	
A_s	=	9.42	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	0.97	[cm]
ρf_y	=	28	[kg/cm ²]
Y'	=	12	
I	=	227813	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.27	[cm]
Δ_{Time}	=	0.08	

OK

OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-3**

Project : **อาคารทิศตะวันตก**

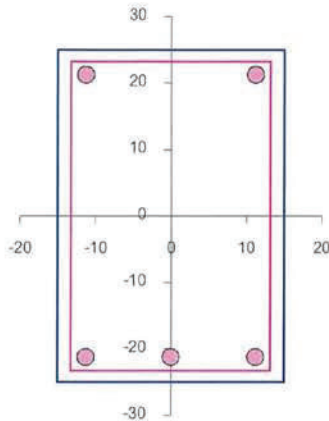
Job No. **193018**

Rev. **1**

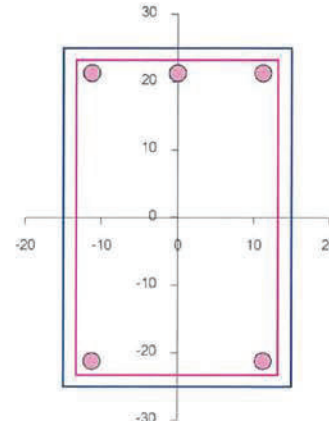
Initial **CKJ**

Date **13-Jan-21**

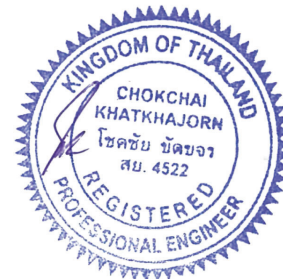
File **Beam B**



Positive Section
DB-3 (30 X 50)



Negative Section
DB-3 (30 X 50)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-3A**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **13-Jan-21**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$	M_u^+	=	15312 [kg-m]
$M_{neg.}$	M_u^-	=	15312 [kg-m]
$V_{max.}$	V_u	=	17500 [kg]
	DL	=	4000 [kg/m]
	LL	=	6000 [kg/m]
Length	L_n	=	350 [cm]
width	b	=	30 [cm]
depth	t	=	50 [cm]
	d'	=	5 [cm]
siding	d''	=	3.5 [cm]

For Positive Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	4.4568	[cm]
A_s	=	9.944	[cm ²]
a	=	4.4568	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	36.425	[cm ²]
a	=	16.325	[cm]
M_u	=	48305	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	9.944	[cm ²]
No. of steel	=	3	
A_s	=	14.73	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	12047	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	72.6	[cm]
S	=	21.420	[cm]

Used Stirrup **RB 9 @ 0.200**

OK



For Negative Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	9.944	[cm ²]
a	=	4.4568	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	47.808	[cm ²]
a	=	21.426	[cm]
M_u	=	59010	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	9.944	[cm ²]
No. of steel	=	3	
A_s	=	14.73	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	0.97	[cm]
ρf_y	=	44	[kg/cm ²]
Y'	=	14.5	
I	=	126380	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.54	[cm]
Δ_{Time}	=	0.17	

Δ_{all} **OK**

Δ_{all} **OK**



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง
(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)
(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-3A**

Project : **อาคารทิศตะวันตก**

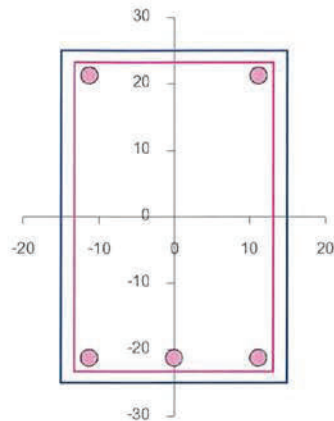
Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **13-Jan-21**

File **Beam B**

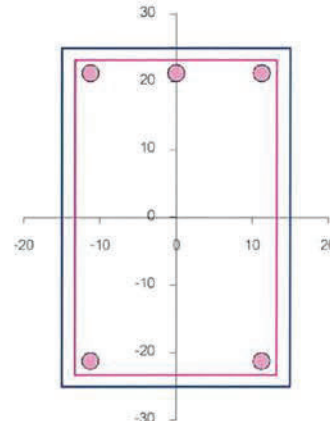


Positive Section
DB-3A (30 X 50)

2 DB 25

**Stirrup RB 9
@ 0.200**

3 DB 25



Negative Section
DB-3A (30 X 50)

3 DB 25

**Stirrup RB 9
@ 0.200**

2 DB 25



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-3B**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	40000	[kg-m]
M _{neg.}	Mu ⁻	=	86765	[kg-m]
V _{max.}	Vu	=	38600	[kg]
	DL	=	1765	[kg/m]
	LL	=	1360	[kg/m]
Length	Ln	=	250	[cm]
width	b	=	30	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	6.9627	[cm]
	As	=	15.536	[cm ²]
	a	=	6.9629	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	0.80		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0360		
p _{max}	=	0.0270		
As	=	60.708	[cm ²]	
a	=	27.208	[cm]	
Mu	=	134181	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	
Σ As	=	15.536	[cm ²]	
No. of steel	=	3		
As	=	18.47	[cm ²]	

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	20079	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	69.7	[cm]
S	=	37.500	[cm]
Used Stirrup	2	DB12 @ 0.360	

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	8.7110	[cm]
	As	=	34.116	[cm ²]
	a	=	15.2903	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	1.05		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0472		
p _{max}	=	0.0354		
As	=	79.680	[cm ²]	
a	=	35.711	[cm]	
Mu	=	163917	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	
Σ As	=	34.116	[cm ²]	
No. of steel	=	6		
As	=	36.95	[cm ²]	

Section OK

Check Deflection

Δ all	=	0.69	[cm]
p fy	=	33	< 35 [kg/cm ²]
Y'	=	21.5	
I	=	1054688	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.01	[cm] < Δ all OK
Δ Time	=	0	< Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

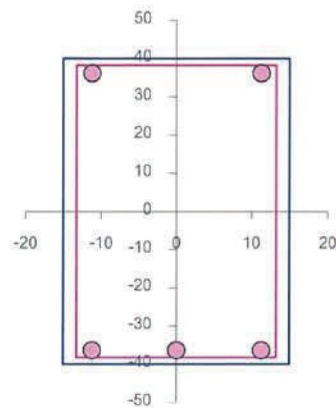
Beam Code **DB-3B**

Project อาคารทิศตะวันตก โซน ซี

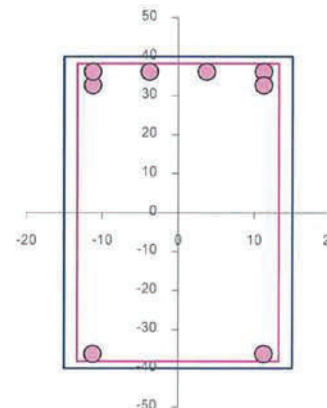
File Name Beam

Engineer CKJ

Date 7 Oct 20



Positive Section
DB-3B (30 X 80)



Negative Section
DB-3B (30 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-4**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ μ	=	11638	[kg-m]
$M_{neg.}$ μ	=	11638	[kg-m]
$V_{max.}$ μ	=	10120	[kg]
DL	=	1680	[kg/m]
LL	=	2720	[kg/m]
Length L_n	=	460	[cm]
width b	=	25	[cm]
depth t	=	50	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	4.0452	[cm]
A_s	=	7.522	[cm ²]
a	=	4.0455	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	30.354	[cm ²]
a	=	16.325	[cm]
μ	=	40254	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	7.522	[cm ²]
No. of steel	=	3	
A_s	=	9.42	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	10039	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	36.1	[cm]
S	=	22.500	[cm]

Used Stirrup **RB 9 @ 0.225** **OK**



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	7.522	[cm ²]
a	=	4.0455	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	39.840	[cm ²]
a	=	21.426	[cm]
μ	=	49175	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	7.522	[cm ²]
No. of steel	=	3	
A_s	=	9.42	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.28	[cm]
ρf_y	=	34	[kg/cm ²]
Y'	=	13	
I	=	189844	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.48	[cm]
Δ_{Time}	=	0.15	

Δ_{all} **OK**

Δ_{all} **OK**

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-4**

Project : **อาคารทิศตะวันตก**

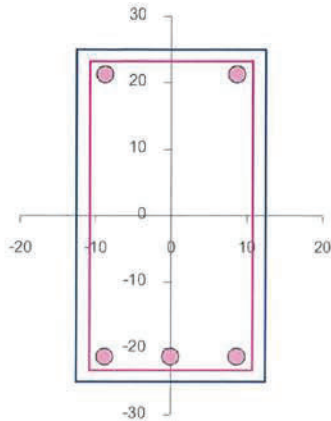
Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

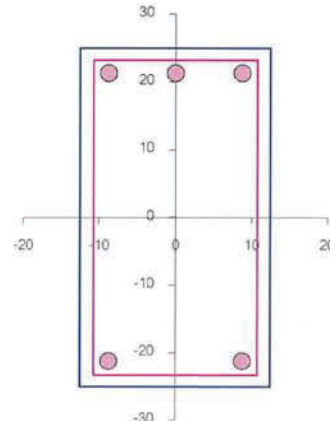


Positive Section
DB-4 (25 X 50)

2 DB 20

Stirrup RB 9
@ 0.225

3 DB 20



Negative Section
DB-4 (25 X 50)

3 DB 20

Stirrup RB 9
@ 0.225

2 DB 20



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-4A**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	8170	[kg-m]
$M_{neg.}$ M_u^-	=	8170	[kg-m]
$V_{max.}$ V_u	=	8225	[kg]
DL	=	1440	[kg/m]
LL	=	1360	[kg/m]
Length L_n	=	400	[cm]
width b	=	25	[cm]
depth t	=	50	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	2.7990	[cm]
A_s	=	5.205	[cm ²]
a	=	2.7994	[cm]
ϕ_{Bend}	=	0.90	
ϕ_{Shea}	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	30.354	[cm ²]
a	=	16.325	[cm]
M_u	=	40254	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]
ΣA_s	=	5.205	[cm ²]
No. of steel	=	3	
A_s	=	6.03	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	10039	[kg]
$L = L_n/2 (V_u - \phi V_c)/V_u$	=	-7.5	[cm]
S	=	-64.377	[cm]

Used Stirrup **RB 9 @ #N/A**

#N/A



For Negative Moment :

Upper Steel	DB 16	▼
Lower Steel	DB 16	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	5.205	[cm ²]
a	=	2.7994	[cm]
ϕ_{Bend}	=	0.90	
ϕ_{Shea}	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	39.840	[cm ²]
a	=	21.426	[cm]
M_u	=	49175	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	4.02	[cm ²]
ΣA_s	=	5.205	[cm ²]
No. of steel	=	3	
A_s	=	6.03	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.11	[cm]
ρf_y	=	21	< 35 [kg/cm ²]
Y'	=	10.8	
I	=	189844	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.17	[cm] < Δ_{all} OK
Δ_{Time}	=	0.06	< Δ_{all} OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-4A**

Project : **อาคารทิศตะวันตก**

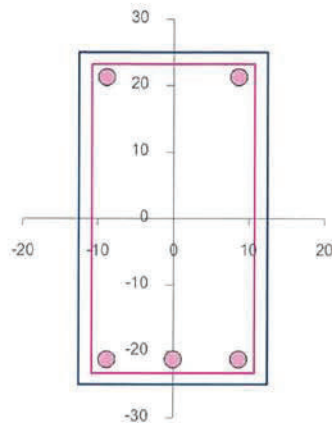
Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**



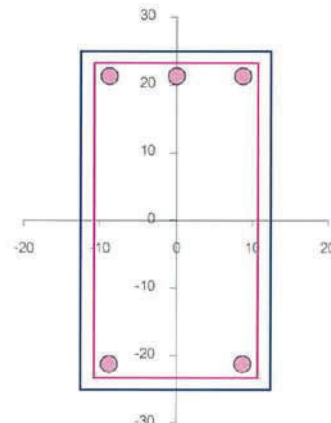
2 DB 16

Stirrup RB 9
@ #N/A

3 DB 16

Positive Section

DB-4A (25 X 50)



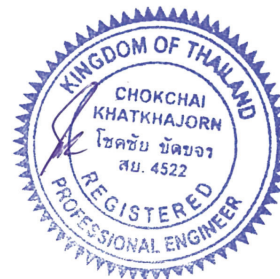
3 DB 16

Stirrup RB 9
@ #N/A

2 DB 16

Negative Section

DB-4A (25 X 50)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-5**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **05-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	20020	[kg-m]
$M_{neg.}$ M_u^-	=	15000	[kg-m]
$V_{max.}$ V_u	=	18858	[kg]
DL	=	1680	[kg/m]
LL	=	1360	[kg/m]
Length L_n	=	460	[cm]
width b	=	25	[cm]
depth t	=	50	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	7.2260	[cm]
A_s	=	13.437	[cm ²]
a	=	7.2265	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	30.354	[cm ²]
a	=	16.325	[cm]
M_u	=	40254	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	13.437	[cm ²]
No. of steel	=	3	
A_s	=	14.73	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	10039	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	125.9	[cm]
S	=	13.245	[cm]
Used Stirrup	2	RB 9 @ 0.125	

OK



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	10.068	[cm ²]
a	=	7.2265	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	39.840	[cm ²]
a	=	21.426	[cm]
M_u	=	49175	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	10.068	[cm ²]
No. of steel	=	4	
A_s	=	12.57	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.28	[cm]
ρf_y	=	52	[kg/cm ²]
Y'	=	15.6	
I	=	120738	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.52	[cm]
Δ_{Time}	=	0.76	

Δ_{all} **OK**

Δ_{all} **OK**



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-5**

Project : **อาคารทิศตะวันตก**

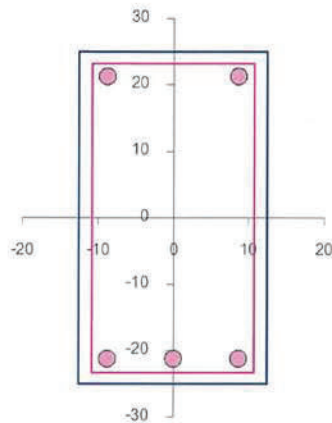
Job No. **193018**

Rev. **1**

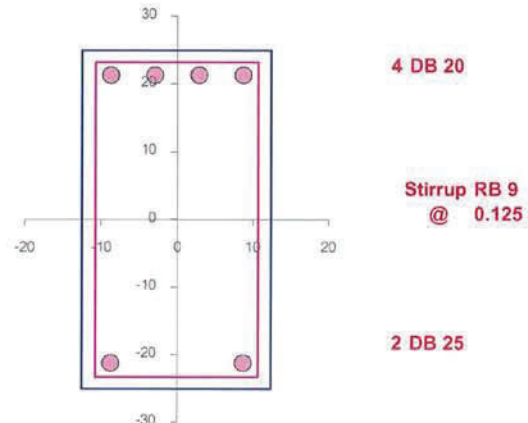
Initial **CKJ**

Date **05-Oct-20**

File **Beam B**



Positive Section
DB-5 (25 X 50)



Negative Section
DB-5 (25 X 50)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-5A**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **06-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ μ^+	=	44161	[kg-m]
$M_{neg.}$ μ^-	=	25000	[kg-m]
$V_{max.}$ V_u	=	21634	[kg]
DL	=	1930	[kg/m]
LL	=	1360	[kg/m]
Length L_n	=	630	[cm]
width b	=	30	[cm]
depth t	=	70	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	65	[cm]
a_{try}	=	9.0943	[cm]
A_s	=	20.292	[cm ²]
a	=	9.0943	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	52.614	[cm ²]
a	=	23.580	[cm]
μ	=	100784	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	20.292	[cm ²]
No. of steel	=	5	
A_s	=	24.54	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	17402	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	99.6	[cm]
S	=	32.500	[cm]

Used Stirrup 2 RB 9 @ 0.300 **OK**



For Negative Moment :

Upper Steel	DB 25	▼
Lower Steel	DB 25	▼
Stirrup Steel	RB 9	▼

d	=	65	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	11.487	[cm ²]
a	=	9.0943	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	69.056	[cm ²]
a	=	30.949	[cm]
μ	=	123120	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	11.487	[cm ²]
No. of steel	=	3	
A_s	=	14.73	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.75	[cm]
ρf_y	=	50	[kg/cm ²]
Y'	=	22.2	
I	=	424129	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.56	[cm]
Δ_{Time}	=	0.84	[cm]

OK OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-5A**

Project : **อาคารทิศตะวันตก**

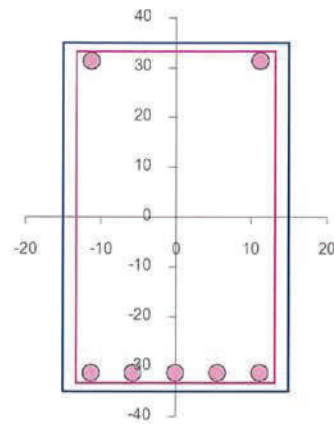
Job No. **193018**

Rev. **1**

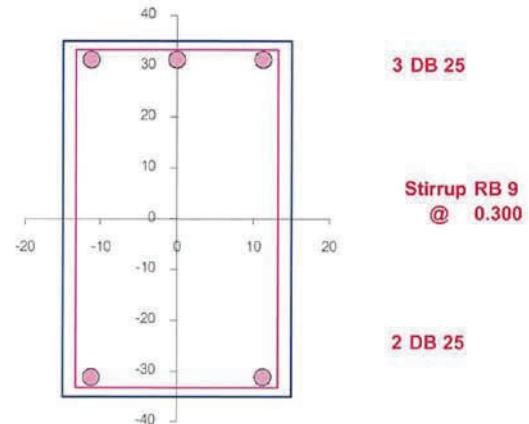
Initial **CKJ**

Date **06-Oct-20**

File **Beam B**



Positive Section
DB-5A (30 X 70)



Negative Section
DB-5A (30 X 70)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-6**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **06-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	16257	[kg-m]
$M_{neg.}$ M_u^-	=	10000	[kg-m]
$V_{max.}$ V_u	=	13198	[kg]
DL	=	2180	[kg/m]
LL	=	2720	[kg/m]
Length L_n	=	480	[cm]
width b	=	25	[cm]
depth t	=	50	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	5.7655	[cm]
A_s	=	10.722	[cm ²]
a	=	5.7665	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	30.354	[cm ²]
a	=	16.325	[cm]
M_u	=	40254	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	10.722	[cm ²]
No. of steel	=	4	
A_s	=	12.57	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	10039	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	84.8	[cm]
S	=	22.500	[cm]

Used Stirrup **RB 9 @ 0.225** **OK**



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	45	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	6.595	[cm ²]
a	=	5.7665	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	39.840	[cm ²]
a	=	21.426	[cm]
M_u	=	49175	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	6.595	[cm ²]
No. of steel	=	3	
A_s	=	9.42	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.33	[cm]
ρf_y	=	45	> 35 [kg/cm ²]
Y'	=	14.6	
I	=	107228	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	1.11	[cm] < Δ_{all} OK
Δ_{Time}	=	0.59	< Δ_{all} OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-6**

Project : **อาคารทิศตะวันตก**

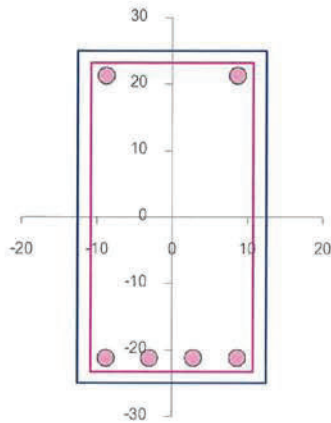
Job No. **193018**

Rev. **1**

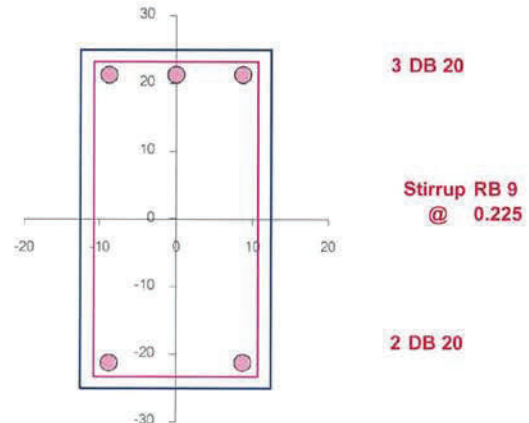
Initial **CKJ**

Date **06-Oct-20**

File **Beam B**



Positive Section
DB-6 (25 X 50)



Negative Section
DB-6 (25 X 50)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-6A**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$ μ^+	=	58678	[kg-m]
$M_{neg.}$ μ^-	=	30000	[kg-m]
$V_{max.}$ V_u	=	33897	[kg]
DL	=	1740	[kg/m]
LL	=	1360	[kg/m]
Length L_n	=	740	[cm]
width b	=	30	[cm]
depth t	=	70	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB25	▼
Lower Steel	DB25	▼
Stirrup Steel	DB12	▼

d	=	65	[cm]
a_{try}	=	12.4264	[cm]
A_s	=	27.726	[cm ²]
a	=	12.4264	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p_{max}	=	0.0270	
A_s	=	52.614	[cm ²]
a	=	23.580	[cm]
μ	=	100784	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	27.726	[cm ²]
No. of steel	=	6	
A_s	=	29.45	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	17402	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	208.5	[cm]
S	=	32.500	[cm]
Used Stirrup	2	DB12 @ 0.300	

OK



For Negative Moment :

Upper Steel	DB25	▼
Lower Steel	DB25	▼
Stirrup Steel	DB12	▼

d	=	65	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	13.741	[cm ²]
a	=	6.1586	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p_{max}	=	0.0354	
A_s	=	69.056	[cm ²]
a	=	30.949	[cm]
μ	=	123120	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	13.741	[cm ²]
No. of steel	=	3	
A_s	=	14.73	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.06	[cm]
ρf_y	=	60	[kg/cm ²]
Y'	=	23.8	
I	=	484769	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.88	[cm]
Δ_{Time}	=	1.29	[cm]

OK

OK



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

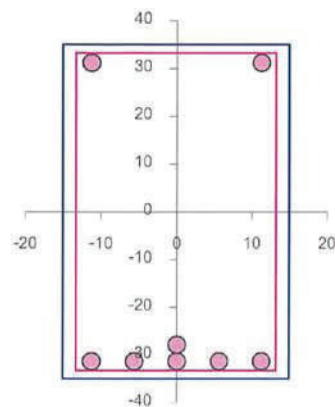
Beam Code **DB-6A**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

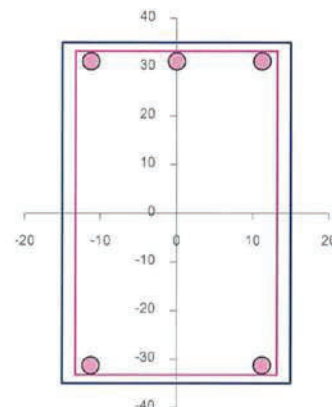


Positive Section
DB-6A (30 X 70)

2 DB25

2 DB12
@ 0.300

6 DB25

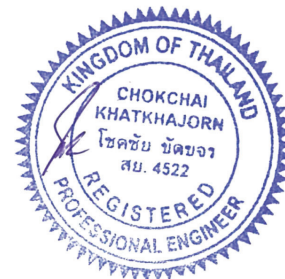


Negative Section
DB-6A (30 X 70)

3 DB25

2 DB12
@ 0.300

2 DB25



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-7**

Project **อาคารทิศตะวันตก โซน ซี**

File Name **Beam**

Engineer **CKJ**

Date **7 Oct 20**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$ μ_u	=	107136	[kg-m]
$M_{neg.}$ μ_u	=	60000	[kg-m]
$V_{max.}$ μ_u	=	43080	[kg]
DL	=	3300	[kg/m]
LL	=	2700	[kg/m]
Length L_n	=	800	[cm]
width b	=	100	[cm]
depth t	=	70	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

d	=	65	[cm]
a_{try}	=	6.4788	[cm]
A_s	=	48.186	[cm ²]
a	=	6.4788	[cm]
ϕ_{Bend}	=	0.90	
ϕ_{Shea}	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p_{max}	=	0.0270	
A_s	=	175.379	[cm ²]
a	=	23.580	[cm]
μ_u	=	335948	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	48.186	[cm ²]
No. of steel	=	10	
A_s	=	49.09	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	58005	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-57.8	[cm]
S	=	-66.987	[cm]

Used Stirrup **2** **DB12 @ #N/A** **#N/A**



For Negative Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

d	=	65	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	27.483	[cm ²]
a	=	3.6951	[cm]
ϕ_{Bend}	=	0.90	
ϕ_{Shea}	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p_{max}	=	0.0354	
A_s	=	230.185	[cm ²]
a	=	30.949	[cm]
μ_u	=	410400	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	27.483	[cm ²]
No. of steel	=	6	
A_s	=	29.45	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.22	[cm]
ρf_y	=	30	[kg/cm ²]
Y'	=	18	
I	=	2288542	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.49	[cm]
Δ_{Time}	=	0.72	[cm]

Δ_{all} OK

Δ_{all} OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

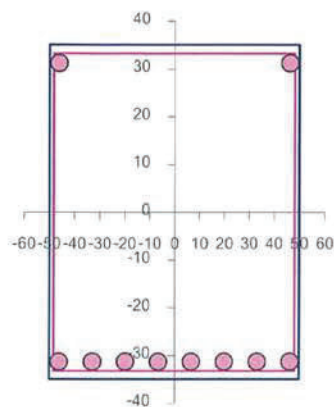
Beam Code **DB-7**

Project อาคารทิศตะวันตก โซน ซี

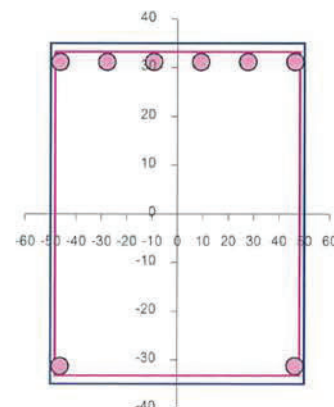
File Name Beam

Engineer **CKJ**

Date 7 Oct 20



Positive Section
DB-7 (100 X 70)



Negative Section
DB-7 (100 X 70)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-8**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	88110	[kg-m]
M _{neg.}	Mu ⁻	=	48000	[kg-m]
V _{max.}	Vu	=	39078	[kg]
	DL	=	2320	[kg/m]
	LL	=	4080	[kg/m]
Length	Ln	=	800	[cm]
width	b	=	30	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

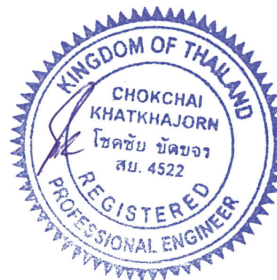
	d	=	75	[cm]
	a try	=	16.4230	[cm]
	As	=	36.646	[cm ²]
	a	=	16.4238	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	0.80		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0360		
p _{max}	=	0.0270		
As	=	60.708	[cm ²]	
a	=	27.208	[cm]	
Mu	=	134181	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	9.82	[cm ²]	
Σ As	=	36.646	[cm ²]	
No. of steel	=	8		
As	=	39.27	[cm ²]	

Section OK

Stirrup Design

	0.53 φ (fc') ^{0.5} bd	=	20079	[kg]
	L=Ln/2(Vu - φ Vc)/Vu	=	225.3	[cm]
	S	=	37.500	[cm]
Used Stirrup	2	DB12 @ 0.360		

OK



For Negative Moment :

Upper Steel	DB25
Lower Steel	DB25
Stirrup Steel	DB12

	d	=	75	[cm]
	a try	=	8.7110	[cm]
	As	=	18.874	[cm ²]
	a	=	8.4589	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	1.05		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0472		
p _{max}	=	0.0354		
As	=	79.680	[cm ²]	
a	=	35.711	[cm]	
Mu	=	163917	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	9.82	[cm ²]	
Σ As	=	18.874	[cm ²]	
No. of steel	=	4		
As	=	19.63	[cm ²]	

Section OK

Check Deflection

Δ all	=	2.22	[cm]	
ρ fy	=	70	>	35 [kg/cm ²]
Y'	=	29		
I	=	825555	[cm ⁴]	
Ec	=	284116	[kg/cm ²]	
Δ	=	1.46	[cm]	< Δ all OK
Δ Time	=	1.8	<	Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

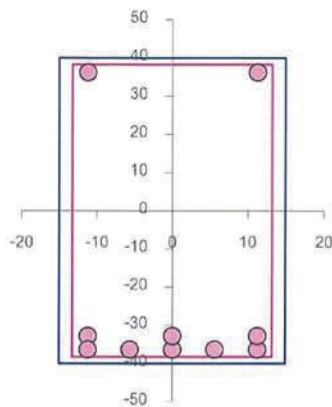
Beam Code **DB-8**

Project อาคารทิศตะวันตก โซน ซี

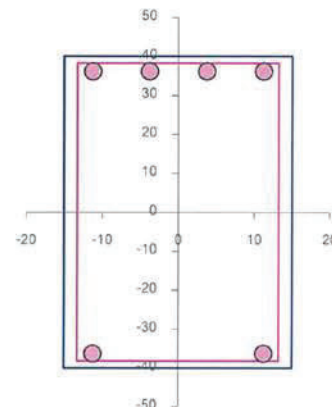
File Name Beam

Engineer **CK.J**

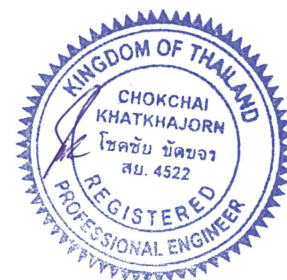
Date 7 Oct 20



Positive Section
DB-8 (30 X 80)



Negative Section
DB-8 (30 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-8A**

Project **อาคารทิศตะวันตก โซน ซี**

File Name **Beam**

Engineer **CKJ**

Date **7 Oct 20**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$	M_u^+	=	0 [kg-m]
$M_{neg.}$	M_u^-	=	88110 [kg-m]
$V_{max.}$	V_u	=	46726 [kg]
	DL	=	4580 [kg/m]
	LL	=	5420 [kg/m]
Length	L_n	=	800 [cm]
width	b	=	30 [cm]
depth	t	=	80 [cm]
	d'	=	5 [cm]
siding	d''	=	3.5 [cm]

For Positive Moment :

Upper Steel	DB25	▼
Lower Steel	DB25	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a_{try}	=	0.0000	[cm]
A_s	=	0.000	[cm ²]
a	=	0.0000	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p_{max}	=	0.0270	
A_s	=	60.708	[cm ²]
a	=	27.208	[cm]
M_u	=	134181	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	0.000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	20079	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	253.9	[cm]
S	=	37.500	[cm]
Used Stirrup	2	DB12 @ 0.360	

OK



For Negative Moment :

Upper Steel	DB25	▼
Lower Steel	DB25	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	34.645	[cm ²]
a	=	15.5273	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p_{max}	=	0.0354	
A_s	=	79.680	[cm ²]
a	=	35.711	[cm]
M_u	=	163917	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	9.82	[cm ²]
ΣA_s	=	34.645	[cm ²]
No. of steel	=	8	
A_s	=	39.27	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.22	[cm]
ρf_y	=	17	< 35 [kg/cm ²]
Y'	=	16.4	
I	=	1054688	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	1.78	[cm] < Δ_{all} OK
Δ_{Time}	=	0.96	< Δ_{all} OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

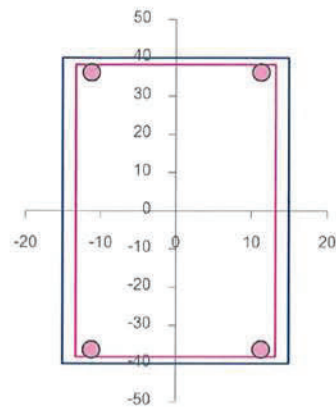
Beam Code DB-8A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20



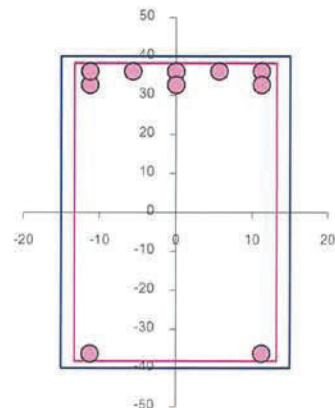
2 DB25

2 DB12
@ 0.360

2 DB25

Positive Section

DB-8A (30 X 80)



8 DB25

2 DB12
@ 0.360

2 DB25

Negative Section

DB-8A (30 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-9**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$ μ	=	187155	[kg-m]
$M_{neg.}$ μ	=	0	[kg-m]
$V_{max.}$ μ	=	73787	[kg]
DL	=	5750	[kg/m]
LL	=	4250	[kg/m]
Length L_n	=	700	[cm]
width b	=	80	[cm]
depth t	=	80	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a_{try}	=	13.4732	[cm]
A_s	=	76.157	[cm ²]
a	=	12.7995	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p_{max}	=	0.0270	
A_s	=	161.889	[cm ²]
a	=	27.208	[cm]
μ	=	357815	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]
ΣA_s	=	76.157	[cm ²]
No. of steel	=	13	
A_s	=	80.05	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	53543	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	134.1	[cm]
S	=	37.500	[cm]
Used Stirrup	2	DB12 @ 0.360	

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	0.000	[cm ²]
a	=	0.0000	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p_{max}	=	0.0354	
A_s	=	212.479	[cm ²]
a	=	35.711	[cm]
μ	=	437113	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]
ΣA_s	=	0.000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.94	[cm]
ρf_y	=	53	[kg/cm ²]
Y'	=	26.9	
I	=	1815583	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.61	[cm]
Δ_{Time}	=	0.9	

Δ_{all} **OK**

Δ_{all} **OK**

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

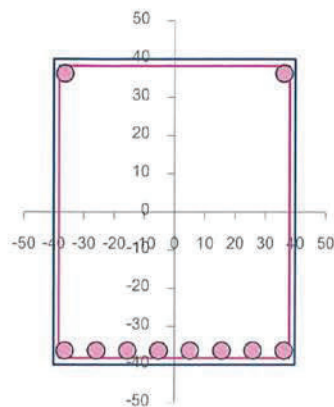
Beam Code **DB-9**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

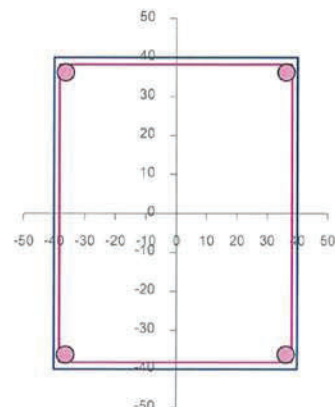


Positive Section
DB-9 (80 X 80)

2 DB28

2 DB12
@ 0.360

13 DB28

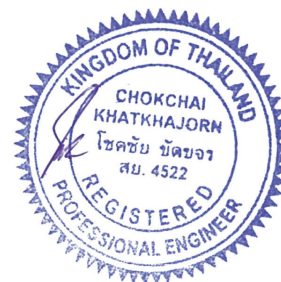


Negative Section
DB-9 (80 X 80)

2 DB28

2 DB12
@ 0.360

2 DB28



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-9A**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 7 Oct 20

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$ μ_u^+	=	0	[kg-m]
$M_{neg.}$ μ_u^-	=	187155	[kg-m]
$V_{max.}$ V_u	=	73787	[kg]
DL	=	5750	[kg/m]
LL	=	4250	[kg/m]
Length L_n	=	700	[cm]
width b	=	80	[cm]
depth t	=	80	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a_{try}	=	0.0000	[cm]
A_s	=	0.000	[cm ²]
a	=	0.0000	[cm]
ϕ_{Bend}	=	0.90	
ϕ_{Shea}	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p_{max}	=	0.0270	
A_s	=	161.889	[cm ²]
a	=	27.208	[cm]
μ_u	=	357815	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]
ΣA_s	=	0.000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	53543	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	134.1	[cm]
S	=	37.500	[cm]

Used Stirrup **2** **DB12 @ 0.360** **OK**



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	73.590	[cm ²]
a	=	12.3681	[cm]
ϕ_{Bend}	=	0.90	
ϕ_{Shea}	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p_{max}	=	0.0354	
A_s	=	212.479	[cm ²]
a	=	35.711	[cm]
μ_u	=	437113	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]
ΣA_s	=	73.590	[cm ²]
No. of steel	=	12	
A_s	=	73.89	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.94	[cm]
ρf_y	=	8	< 35 [kg/cm ²]
Y'	=	11.7	
I	=	2812500	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.39	[cm] < Δ_{all} OK
Δ_{Time}	=	0.23	< Δ_{all} OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

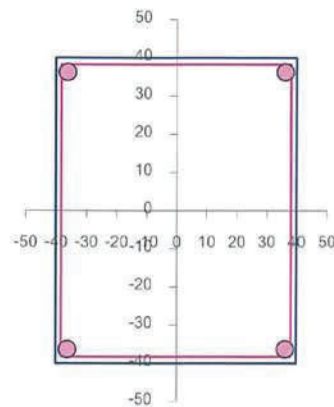
Beam Code DB-9A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

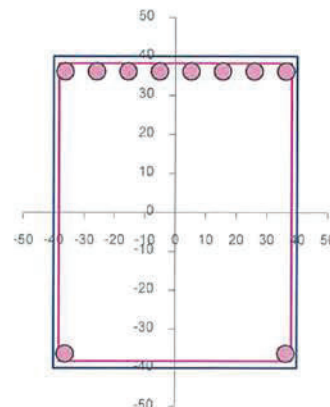


Positive Section
DB-9A (80 X 80)

2 DB28

2 DB12
@ 0.360

2 DB28



Negative Section
DB-9A (80 X 80)

12 DB28

2 DB12
@ 0.360

2 DB28



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-10**

Project **อาคารทิศตะวันตก โซน ซี**

File Name **Beam**

Engineer **CKJ**

Date **7 Oct 20**

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	102736	[kg-m]
M _{neg.}	Mu ⁻	=	50000	[kg-m]
V _{max.}	Vu	=	46882	[kg]
	DL	=	3580	[kg/m]
	LL	=	4770	[kg/m]
Length	Ln	=	700	[cm]
width	b	=	30	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d"	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	19.6186	[cm]
	As	=	43.776	[cm ²]
	a	=	19.6194	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	0.80		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0360		
p _{max}	=	0.0270		
As	=	60.708	[cm ²]	
a	=	27.208	[cm]	
Mu	=	134181	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	
Σ As	=	43.776	[cm ²]	
No. of steel	=	8		
As	=	49.26	[cm ²]	

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	20079	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	222.6	[cm]
S	=	37.500	[cm]

Used Stirrup **2** **DB12 @ 0.360**

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	8.7110	[cm]
	As	=	19.660	[cm ²]
	a	=	8.8113	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	1.05		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
p	=	0.0472		
p _{max}	=	0.0354		
As	=	79.680	[cm ²]	
a	=	35.711	[cm]	
Mu	=	163917	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	
Σ As	=	19.660	[cm ²]	
No. of steel	=	4		
As	=	24.63	[cm ²]	

Section OK

Check Deflection

Δ all	=	1.94	[cm]	
p fy	=	88	>	35 [kg/cm ²]
Y'	=	31.6		
I	=	965036	[cm ⁴]	
Ec	=	284116	[kg/cm ²]	
Δ	=	0.95	[cm]	< Δ all OK
Δ Time	=	1.25	<	Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

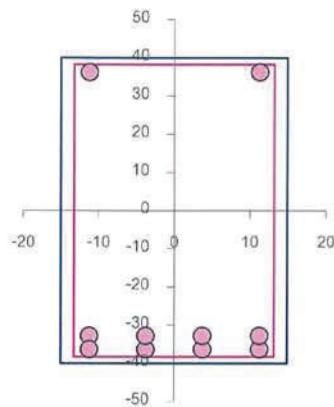
Beam Code **DB-10**

Project อาคารทิศตะวันตก โซน ซี

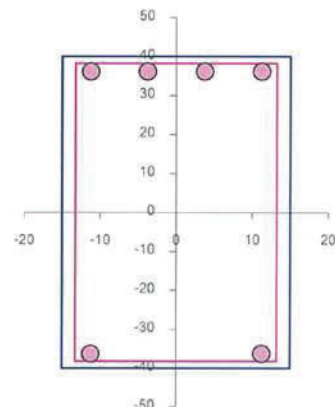
File Name Beam

Engineer CK.J

Date 7 Oct 20



Positive Section
DB-10 (30 X 80)



Negative Section
DB-10 (30 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-10A**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
$M_{pos.}$	M_u^+	=	109774 [kg-m]
$M_{neg.}$	M_u^-	=	50000 [kg-m]
$V_{max.}$	V_u	=	60136 [kg]
	DL	=	5150 [kg/m]
	LL	=	7150 [kg/m]
Length	L_n	=	700 [cm]
width	b	=	80 [cm]
depth	t	=	80 [cm]
	d'	=	5 [cm]
siding	d''	=	3.5 [cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a_{try}	=	7.1765	[cm]
A_s	=	42.700	[cm ²]
a	=	7.1765	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0360	
p_{max}	=	0.0270	
A_s	=	161.889	[cm ²]
a	=	27.208	[cm]
M_u	=	357815	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]
ΣA_s	=	42.700	[cm ²]
No. of steel	=	7	
A_s	=	43.10	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	53543	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	85.1	[cm]
S	=	37.500	[cm]

Used Stirrup 2 DB12 @ 0.360 **OK**



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	19.660	[cm ²]
a	=	3.3042	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
p	=	0.0472	
p_{max}	=	0.0354	
A_s	=	212.479	[cm ²]
a	=	35.711	[cm]
M_u	=	437113	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	12.32	[cm ²]
ΣA_s	=	19.660	[cm ²]
No. of steel	=	4	
A_s	=	24.63	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	1.94	[cm]
ρf_y	=	29	< 35 [kg/cm ²]
Y'	=	20.3	
I	=	2812500	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.48	[cm] < Δ_{all} OK
Δ_{Time}	=	0.63	< Δ_{all} OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

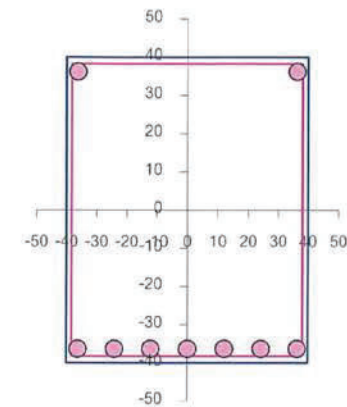
Beam Code **DB-10A**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer **CKJ**

Date 7 Oct 20

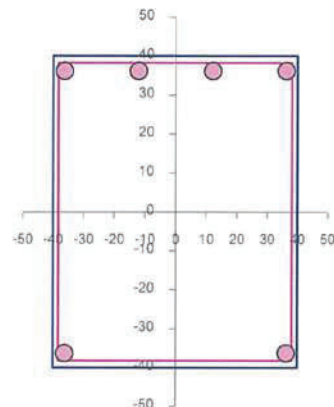


Positive Section
DB-10A (80 X 80)

2 DB28

2 DB12
@ 0.360

7 DB28

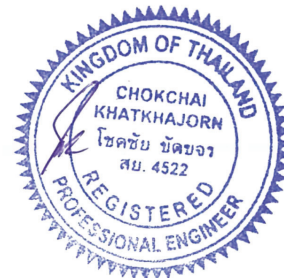


Negative Section
DB-10A (80 X 80)

4 DB28

2 DB12
@ 0.360

2 DB28



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code DB-11A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu'	=	92062	[kg-m]
M _{neg.}	Mu'	=	60000	[kg-m]
V _{max.}	Vu	=	55389	[kg]
	DL	=	4970	[kg/m]
	LL	=	6130	[kg/m]
Length	Ln	=	560	[cm]
width	b	=	40	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a try	=	12.5034	[cm]
As	=	37.198	[cm ²]
a	=	12.5034	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	80.944	[cm ²]
a	=	27.208	[cm]
Mu	=	178907	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	37.198	[cm ²]
No. of steel	=	7	
As	=	43.10	[cm ²]

Section OK

Stirrup Design

	0.53 φ (fc') ^{0.5} bd	=	26772	[kg]
	L=Ln/2(Vu - φ Vc)/Vu	=	165.0	[cm]
	S	=	37.500	[cm]
Used Stirrup	2	DB12 @ 0.360		

OK



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a try	=	8.7110	[cm]
As	=	23.592	[cm ²]
a	=	7.9302	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	106.239	[cm ²]
a	=	35.711	[cm]
Mu	=	218556	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	23.592	[cm ²]
No. of steel	=	4	
As	=	24.63	[cm ²]

Section OK

Check Deflection

Δ all	=	1.56	[cm]
ρ fy	=	57	[kg/cm ²]
Y'	=	26.9	
I	=	957593	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	0.52	[cm]
Δ Time	=	0.7	

Δ all OK

Δ all OK



รายงานการออกแบบ Design Note รายการคำนวณงานโครงสร้าง

(สัญญาก่อสร้างอาคารทิศตะวันตก Final Detailed Design)

(ส่วนงานโครงสร้าง งานสถาปัตยกรรม และงานระบบหลัก)

โครงการพัฒนาพื้นที่ส่วนขยายศูนย์ราชการเฉลิมพระเกียรติ ๘๐ พรรษา ๕ ธันวาคม ๒๕๕๐ พื้นที่โซน C

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

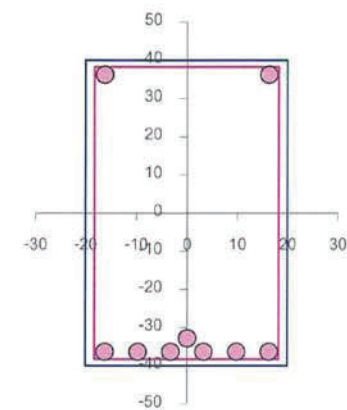
Beam Code DB-11A

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

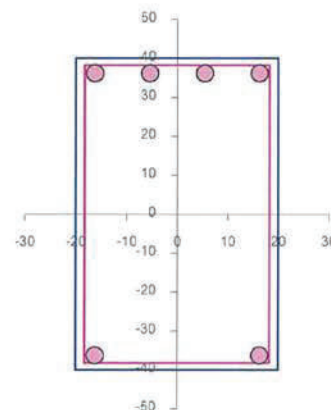


Positive Section
DB-11A (40 X 80)

2 DB28

2 DB12
@ 0.360

7 DB28



Negative Section
DB-11A (40 X 80)

4 DB28

2 DB12
@ 0.360

2 DB28



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-11B**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **07-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	2050	[kg-m]
$M_{neg.}$ M_u^-	=	2050	[kg-m]
$V_{max.}$ V_u	=	6035	[kg]
DL	=	4700	[kg/m]
LL	=	5000	[kg/m]
Length L_n	=	130	[cm]
width b	=	40	[cm]
depth t	=	60	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	55	[cm]
a_{try}	=	0.3489	[cm]
A_s	=	1.039	[cm ²]
a	=	0.3491	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	59.359	[cm ²]
a	=	19.953	[cm]
M_u	=	96212	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	1.039	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	19632	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-114.7	[cm]
S	=	-10.499	[cm]

Used Stirrup 2 **RB 9 @ #N/A** **#N/A**



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	55	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	1.039	[cm ²]
a	=	0.3491	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	77.909	[cm ²]
a	=	26.188	[cm]
M_u	=	117535	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	1.039	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	0.36	[cm]
ρf_y	=	11	[kg/cm ²]
γ'	=	9.95	
I	=	554583	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.00	[cm]
Δ_{Time}	=	0	

OK
OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-11B**

Project : **อาคารทิศตะวันตก**

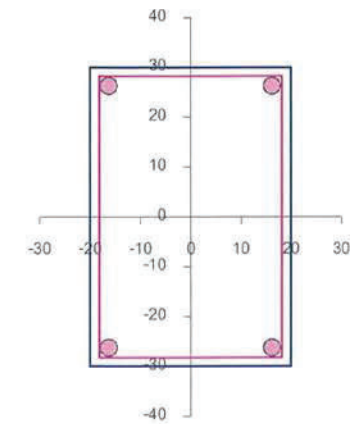
Job No. **193018**

Rev. **1**

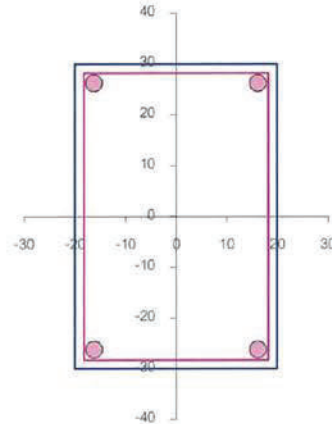
Initial **CKJ**

Date **07-Oct-20**

File **Beam B**



Positive Section
DB-11B (40 X 60)



Negative Section
DB-11B (40 X 60)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-11C**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	154282	[kg-m]
M _{neg.}	Mu ⁻	=	80000	[kg-m]
V _{max.}	Vu	=	79215	[kg]
	DL	=	7200	[kg/m]
	LL	=	6800	[kg/m]
Length	Ln	=	700	[cm]
width	b	=	80	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a try	=	10.3126	[cm]
As	=	61.360	[cm ²]
a	=	10.3126	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	0.80	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ _{max}	=	0.0270	
As	=	161.889	[cm ²]
a	=	27.208	[cm]
Mu	=	357815	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	61.360	[cm ²]
No. of steel	=	10	
As	=	61.58	[cm ²]

Section OK

Stirrup Design

0.53 φ (fc') ^{0.5} bd	=	53543	[kg]
L=Ln/2(Vu - φ Vc)/Vu	=	148.9	[cm]
S	=	37.500	[cm]

Used Stirrup 2 DB12 @ 0.360 **OK**



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

d	=	75	[cm]
a try	=	8.7110	[cm]
As	=	31.456	[cm ²]
a	=	5.2868	[cm]
φ Bend	=	0.90	
φ Shea	=	0.85	
k1	=	1.05	
Es	=	2040000	[kg/cm ²]
Ec	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ _{max}	=	0.0354	
As	=	212.479	[cm ²]
a	=	35.711	[cm]
Mu	=	437113	[kg-m]
M1	=	0	[kg-m]
As'	=	0.0000	[cm ²]
No. of steel	=	2	
As	=	12.32	[cm ²]
Σ As	=	31.456	[cm ²]
No. of steel	=	6	
As	=	36.95	[cm ²]

Section OK

Check Deflection

Δ all	=	1.94	[cm]
ρ fy	=	41	[kg/cm ²]
Y'	=	23.5	
I	=	1489262	[cm ⁴]
Ec	=	284116	[kg/cm ²]
Δ	=	1.03	[cm]
Δ Time	=	1.47	

Δ all **OK**
Δ all **OK**

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

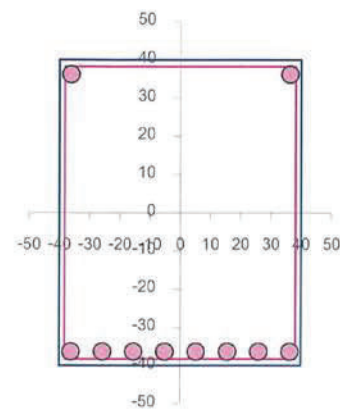
Beam Code **DB-11C**

Project อาคารทิศตะวันตก โซน ซี

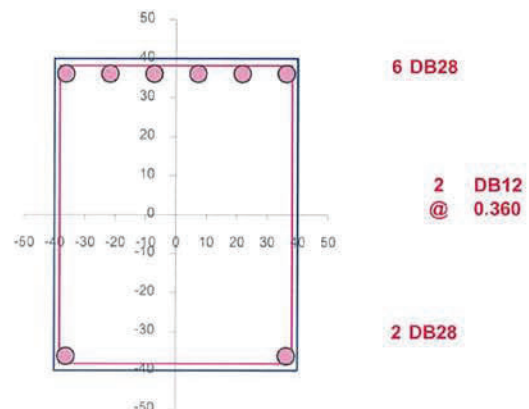
File Name Beam

Engineer CKJ

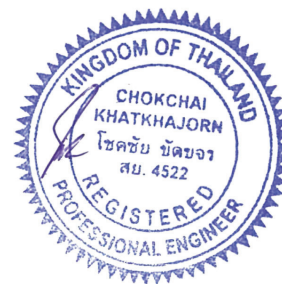
Date 7 Oct 20



Positive Section
DB-11C (80 X 80)



Negative Section
DB-11C (80 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-12**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

	fc'	=	350	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
	fy SD	=	4000	[kg/cm ²]
M _{pos.}	Mu ⁺	=	110059	[kg-m]
M _{neg.}	Mu ⁻	=	55000	[kg-m]
V _{max.}	Vu	=	49763	[kg]
	DL	=	4950	[kg/m]
	LL	=	4250	[kg/m]
Length	Ln	=	760	[cm]
width	b	=	40	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	15.2527	[cm]
	As	=	45.377	[cm ²]
	a	=	15.2527	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	0.80		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
ρ	=	0.0360		
ρ _{max}	=	0.0270		
As	=	80.944	[cm ²]	
a	=	27.208	[cm]	
Mu	=	178907	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	
Σ As	=	45.377	[cm ²]	
No. of steel	=	8		
As	=	49.26	[cm ²]	

Section OK

Stirrup Design

	0.53 φ (fc') ^{0.5} bd	=	26772	[kg]
	L=Ln/2(Vu - φ Vc)/Vu	=	206.2	[cm]
	S	=	37.500	[cm]

Used Stirrup 2 **DB12 @ 0.360** **OK**



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a try	=	8.7110	[cm]
	As	=	21.626	[cm ²]
	a	=	7.2693	[cm]
φ Bend	=	0.90		
φ Shea	=	0.85		
k1	=	1.05		
Es	=	2040000	[kg/cm ²]	
Ec	=	284553	[kg/cm ²]	
n	=	7		
ρ	=	0.0472		
ρ _{max}	=	0.0354		
As	=	106.239	[cm ²]	
a	=	35.711	[cm]	
Mu	=	218556	[kg-m]	
M1	=	0	[kg-m]	
As'	=	0.0000	[cm ²]	
No. of steel	=	2		
As	=	12.32	[cm ²]	
Σ As	=	21.626	[cm ²]	
No. of steel	=	4		
As	=	24.63	[cm ²]	

Section OK

Check Deflection

Δ all	=	2.11	[cm]	
ρ fy	=	66	>	35 [kg/cm ²]
Y'	=	28.4		
I	=	1054215	[cm ⁴]	
Ec	=	284116	[kg/cm ²]	
Δ	=	1.33	[cm]	< Δ all OK
Δ Time	=	1.93	<	Δ all OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

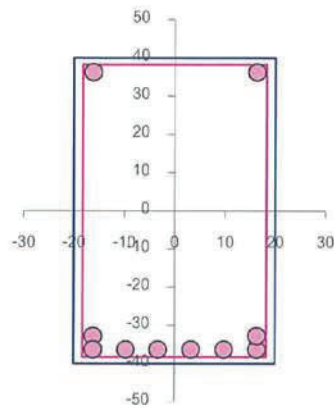
Beam Code **DB-12**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20



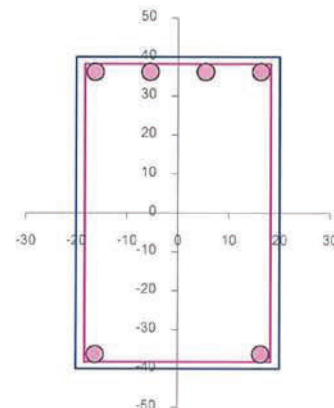
Positive Section

DB-12 (40 X 80)

2 DB28

2 DB12
@ 0.360

8 DB28



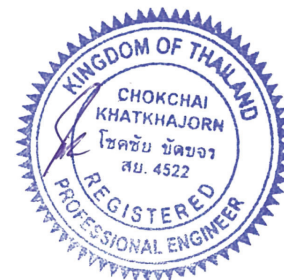
Negative Section

DB-12 (40 X 80)

4 DB28

2 DB12
@ 0.360

2 DB28



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-12A**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 13 Jan 21

	f_c'	=	350	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
M _{pos.}	M_u^+	=	151060	[kg-m]
M _{neg.}	M_u^-	=	75530	[kg-m]
V _{max.}	V_u	=	66394	[kg]
	DL	=	6600	[kg/m]
	LL	=	6800	[kg/m]
Length	L_n	=	760	[cm]
width	b	=	100	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a_{try}	=	7.9430	[cm]
	A_s	=	59.076	[cm ²]
	a	=	7.9431	[cm]
ϕ Bend		=	0.90	
ϕ Shea		=	0.85	
k_1		=	0.80	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0360	
ρ_{max}		=	0.0270	
A_s		=	202.361	[cm ²]
a		=	27.208	[cm]
M_u		=	447268	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	12.32	[cm ²]
ΣA_s		=	59.076	[cm ²]
No. of steel		=	10	
A_s		=	61.58	[cm ²]

Section OK

Stirrup Design

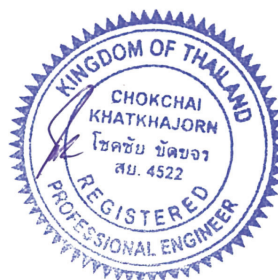
$$0.53 \phi (f_c')^{0.5} b d = 66929 \text{ [kg]}$$

$$L = L_n / (V_u - \phi V_c) / V_u = 54.4 \text{ [cm]}$$

$$S = -2156.665 \text{ [cm]}$$

Used Stirrup 2 DB12 @ #N/A

#N/A



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a_{try}	=	8.7110	[cm]
	A_s	=	29.699	[cm ²]
	a	=	3.9931	[cm]
ϕ Bend		=	0.90	
ϕ Shea		=	0.85	
k_1		=	1.05	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0472	
ρ_{max}		=	0.0354	
A_s		=	265.598	[cm ²]
a		=	35.711	[cm]
M_u		=	546391	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	12.32	[cm ²]
ΣA_s		=	29.699	[cm ²]
No. of steel		=	5	
A_s		=	30.79	[cm ²]

Section OK

Check Deflection

$$\Delta_{all} = 2.11 \text{ [cm]}$$

$$\rho f_y = 33 < 35 \text{ [kg/cm²]}$$

$$Y' = 21.5$$

$$I = 3515625 \text{ [cm⁴]}$$

$$E_c = 284116 \text{ [kg/cm²]}$$

$$\Delta = 0.58 \text{ [cm]} < \Delta_{all} \text{ OK}$$

$$\Delta_{Time} = 0.81 < \Delta_{all} \text{ OK}$$

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

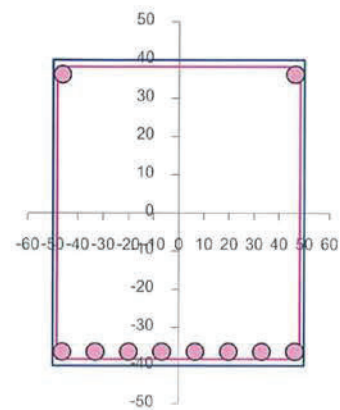
Beam Code **DB-12A**

Project อาคารทิศตะวันตก โซน ซี

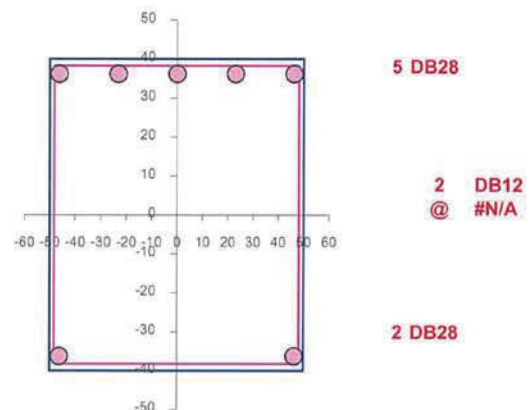
File Name Beam

Engineer CKJ

Date 13 Jan 21



Positive Section
DB-12A (100 X 80)



Negative Section
DB-12A (100 X 80)



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-12B**

Project : **อาคารทิศตะวันตก**

Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **07-Oct-20**

File **Beam B**

f_c'	=	350	[kg/cm ²]
f_y SD	=	4000	[kg/cm ²]
f_y SR	=	2400	[kg/cm ²]
$M_{pos.}$ M_u^+	=	9985	[kg-m]
$M_{neg.}$ M_u^-	=	9985	[kg-m]
$V_{max.}$ V_u	=	12480	[kg]
DL	=	4000	[kg/m]
LL	=	3800	[kg/m]
Length L_n	=	320	[cm]
width b	=	30	[cm]
depth t	=	60	[cm]
d'	=	5	[cm]
siding d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	55	[cm]
a_{try}	=	2.3083	[cm]
A_s	=	5.151	[cm ²]
a	=	2.3086	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	0.80	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0360	
ρ_{max}	=	0.0270	
A_s	=	44.519	[cm ²]
a	=	19.953	[cm]
M_u	=	72159	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	5.151	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]

Section OK

Stirrup Design

$0.53 \phi (f_c')^{0.5} b d$	=	14724	[kg]
$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	-0.5	[cm]
S	=	-63.607	[cm]

Used Stirrup: 2 RB 9 @ #N/A **#N/A**



For Negative Moment :

Upper Steel	DB 20	▼
Lower Steel	DB 20	▼
Stirrup Steel	RB 9	▼

d	=	55	[cm]
a_{try}	=	8.7110	[cm]
A_s	=	5.151	[cm ²]
a	=	2.3086	[cm]
ϕ Bend	=	0.90	
ϕ Shea	=	0.85	
k_1	=	1.05	
E_s	=	2040000	[kg/cm ²]
E_c	=	284553	[kg/cm ²]
n	=	7	
ρ	=	0.0472	
ρ_{max}	=	0.0354	
A_s	=	58.432	[cm ²]
a	=	26.188	[cm]
M_u	=	88151	[kg-m]
M_1	=	0	[kg-m]
A_s'	=	0.0000	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]
ΣA_s	=	5.151	[cm ²]
No. of steel	=	2	
A_s	=	6.28	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	0.89	[cm]
ρf_y	=	15	[kg/cm ²]
Y'	=	11.3	
I	=	415938	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	0.09	[cm]
Δ_{Time}	=	0.05	[cm]

Δ_{all} **OK**

Δ_{all} **OK**

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

Design Reinforced Concrete Beam

(Ultimate Stress Design method in accordance with ACI 318)

Beam No. **DB-12B**

Project : **อาคารทิศตะวันตก**

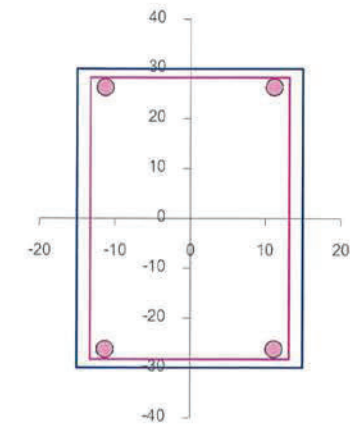
Job No. **193018**

Rev. **1**

Initial **CKJ**

Date **07-Oct-20**

File **Beam B**

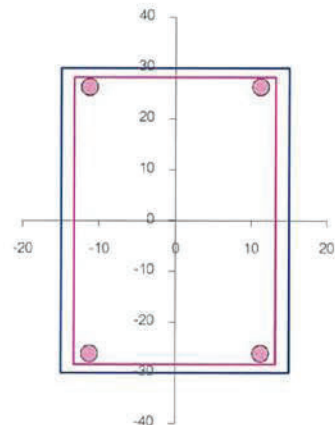


Positive Section
DB-12B (30 X 60)

2 DB 20

Stirrup RB 9
@ #N/A

2 DB 20



Negative Section
DB-12B (30 X 60)

2 DB 20

Stirrup RB 9
@ #N/A

2 DB 20



DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

Beam Code **DB-13**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

Engineer CKJ

Date 7 Oct 20

	f_c'	=	350	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
	f_y SD	=	4000	[kg/cm ²]
M _{pos.}	M_u^+	=	100000	[kg-m]
M _{neg.}	M_u^-	=	84000	[kg-m]
V _{max.}	V_u	=	38298	[kg]
	DL	=	4450	[kg/m]
	LL	=	3850	[kg/m]
Length	L_n	=	760	[cm]
width	b	=	40	[cm]
depth	t	=	80	[cm]
	d'	=	5	[cm]
siding	d''	=	3.5	[cm]

For Positive Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a_{try}	=	13.7008	[cm]
	A_s	=	40.760	[cm ²]
	a	=	13.7008	[cm]
φ Bend		=	0.90	
φ Shea		=	0.85	
k_1		=	0.80	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0360	
ρ_{max}		=	0.0270	
A_s		=	80.944	[cm ²]
a		=	27.208	[cm]
M_u		=	178907	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	12.32	[cm ²]
ΣA_s		=	40.760	[cm ²]
No. of steel		=	7	
A_s		=	43.10	[cm ²]

Section OK

Stirrup Design

	$0.53 \phi (f_c')^{0.5} b d$	=	26772	[kg]
	$L = L_n / 2 (V_u - \phi V_c) / V_u$	=	154.2	[cm]
	S	=	37.500	[cm]

Used Stirrup 2 **DB12 @ 0.360** **OK**



For Negative Moment :

Upper Steel	DB28	▼
Lower Steel	DB28	▼
Stirrup Steel	DB12	▼

	d	=	75	[cm]
	a_{try}	=	8.7110	[cm]
	A_s	=	33.029	[cm ²]
	a	=	11.1023	[cm]
φ Bend		=	0.90	
φ Shea		=	0.85	
k_1		=	1.05	
E_s		=	2040000	[kg/cm ²]
E_c		=	284553	[kg/cm ²]
n		=	7	
ρ		=	0.0472	
ρ_{max}		=	0.0354	
A_s		=	106.239	[cm ²]
a		=	35.711	[cm]
M_u		=	218556	[kg-m]
M_1		=	0	[kg-m]
A_s'		=	0.0000	[cm ²]
No. of steel		=	2	
A_s		=	12.32	[cm ²]
ΣA_s		=	33.029	[cm ²]
No. of steel		=	6	
A_s		=	36.95	[cm ²]

Section OK

Check Deflection

Δ_{all}	=	2.11	[cm]
ρf_y	=	57	[kg/cm ²]
Y'	=	26.9	
I	=	957593	[cm ⁴]
E_c	=	284116	[kg/cm ²]
Δ	=	1.33	[cm]
Δ_{Time}	=	1.91	[cm]

OK

OK

DYNAMIC ENGINEERING CONSULTANT CO., LTD.

RC-I EXCEL

Ultimate Stress Design method in accordance with ACI 318

Design Reinforced Concrete Beam

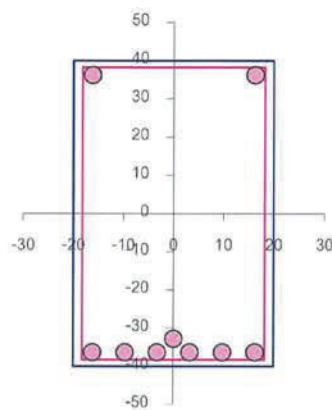
Beam Code **DB-13**

Project อาคารทิศตะวันตก โซน ซี

File Name Beam

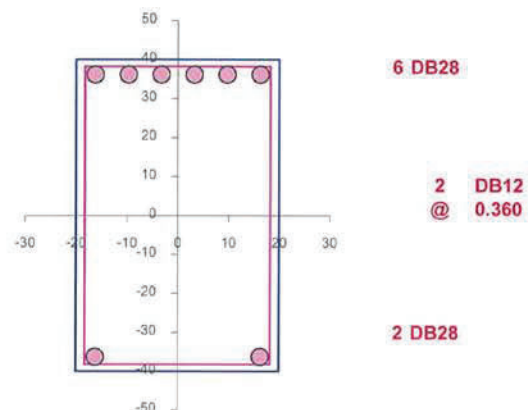
Engineer CKJ

Date 7 Oct 20



Positive Section

DB-13 (40 X 80)



Negative Section

DB-13 (40 X 80)

