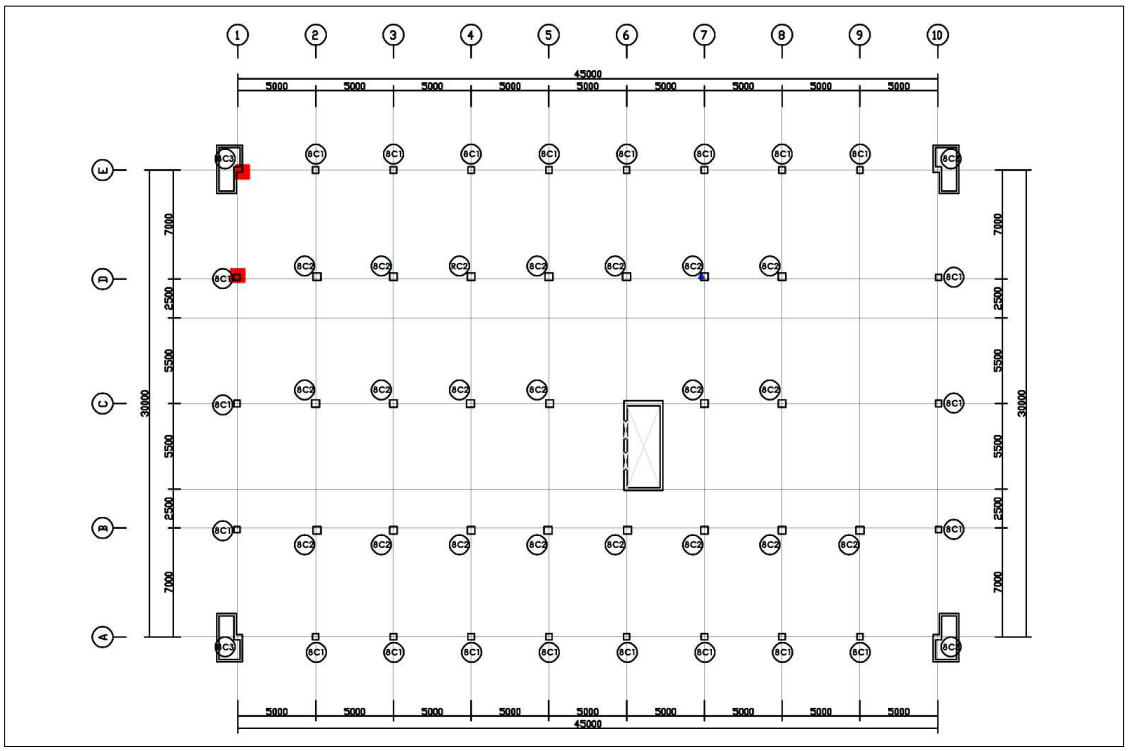
부 록

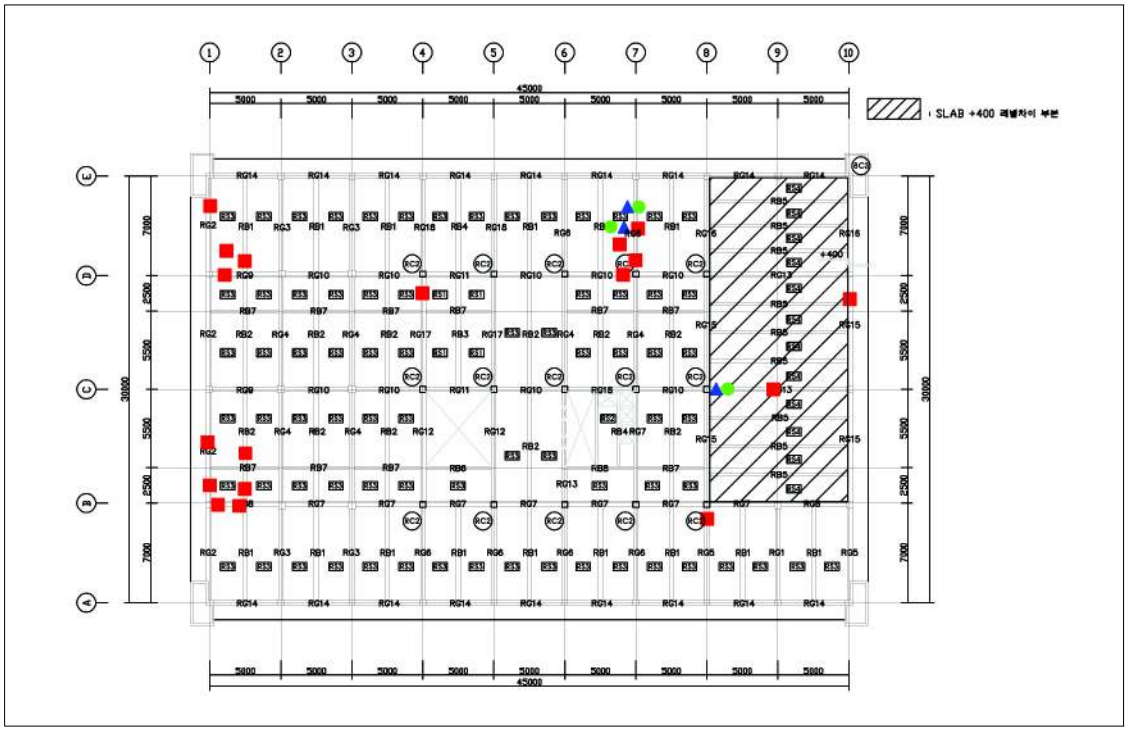
1. 시험 위치도
2. 균열 및 변형 위치도
3. 콘크리트 강도 측정 DATA
4. FERROSCAN IMAGE
5. 구조검토 근거
6. 보강 위치도
7. 건축물 대장

부록 1. 시험위치도

도 시	내 용
■	철근배근 상태 조사
▲	콘크리트 강도 조사
●	초음파 시험 조사

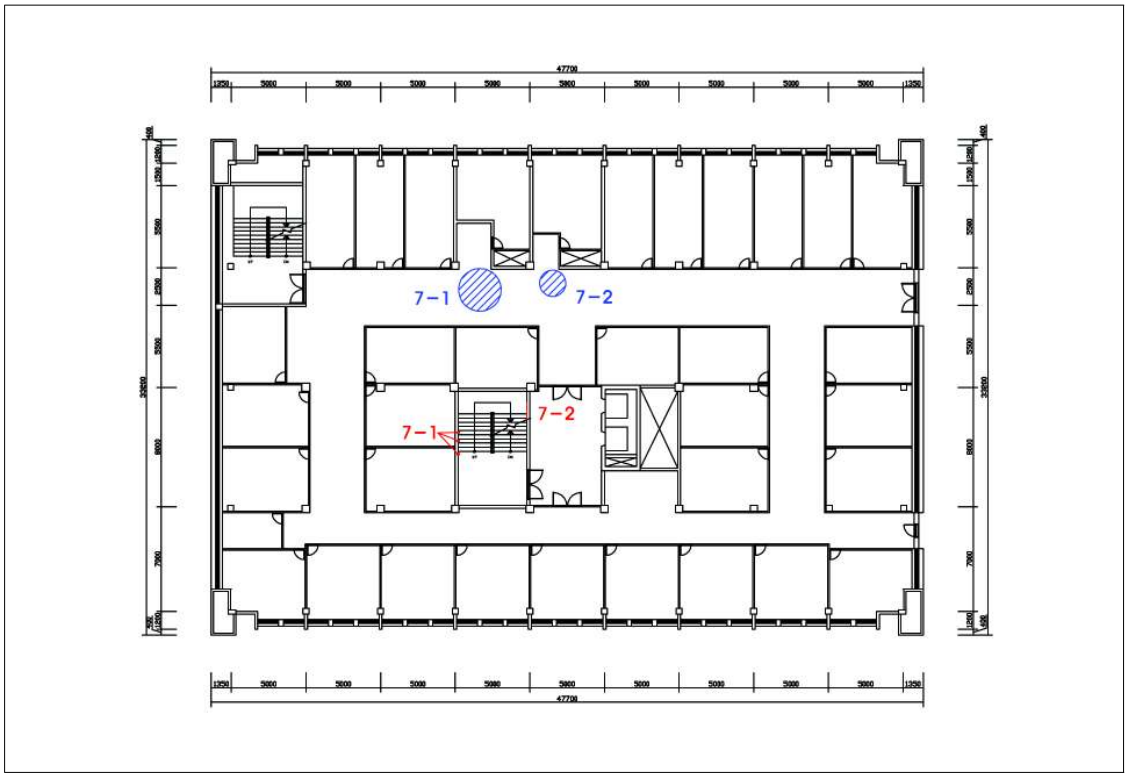


[그림 1] 지상8층 바닥 시험 위치도

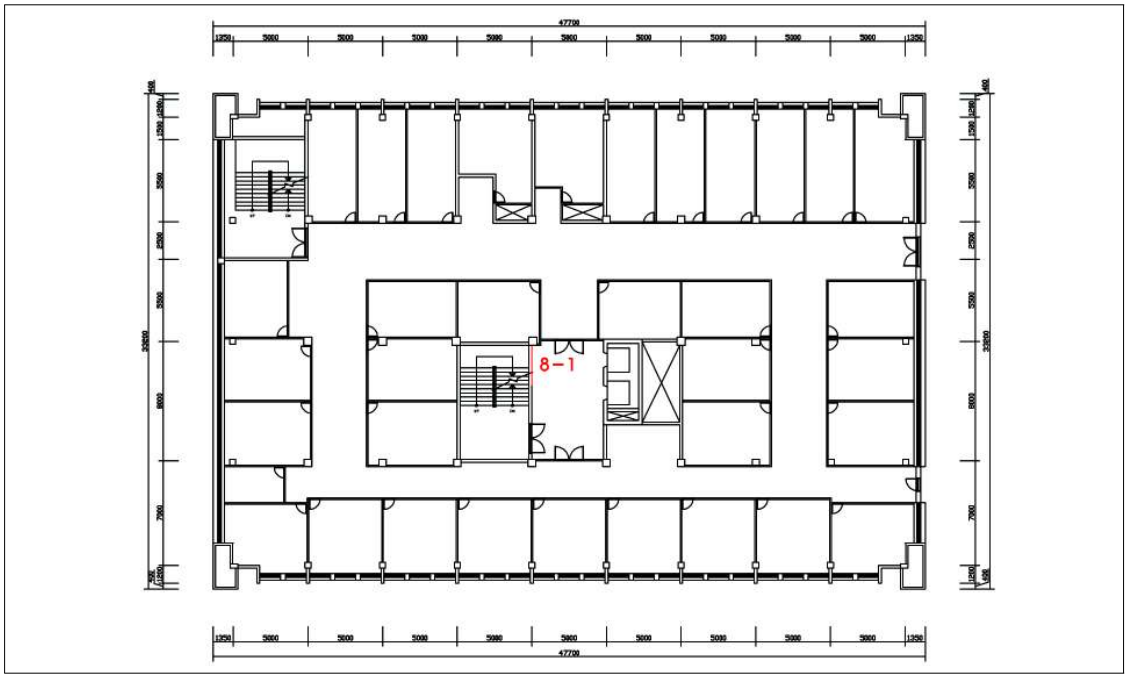


[그림 2] 지붕층 바닥 시험 위치도

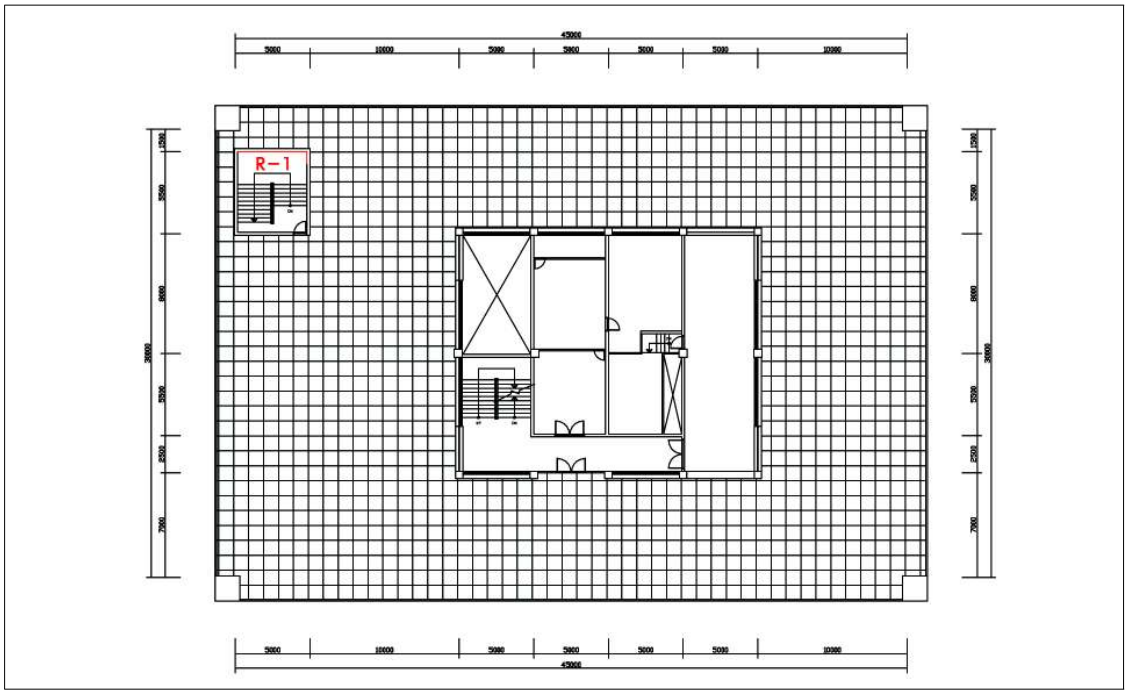
부록 2. 균열 및 변형 위치도



[그림 3] 지상7층 균열 및 변형 위치도



[그림 4] 지상8층 균열 및 변형 위치도



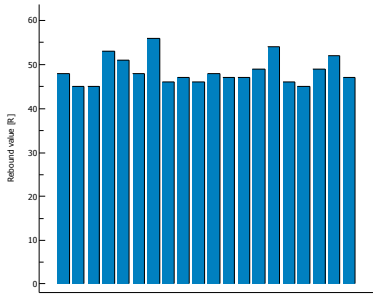
[그림 5] 지붕층 균열 및 변형 위치도

부록 3. 콘크리트 강도 측정 DATA

▦ 슈미트 해머 이미지

PROCEQ - DIGISCHMIDT (4.2, 85-2369, ND 4050)

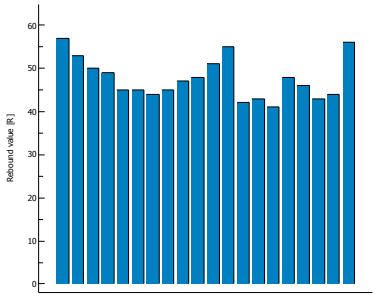
Title: AAAAAAAAAA 2459 **Date:** 25-Aug-2008 10:44 **Name:**
Remarks:



1

PROCEQ - DIGISCHMIDT (4.2, 85-2369, ND 4050)

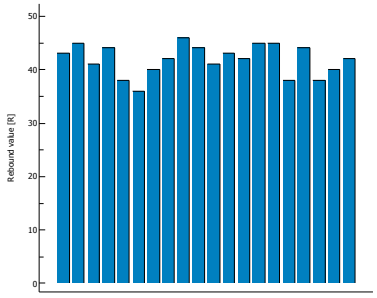
Title: AAAAAAAAAA 2460 **Date:** 25-Aug-2008 10:45 **Name:**
Remarks:



2

PROCEQ - DIGISCHMIDT (4.2, 85-2369, ND 4050)

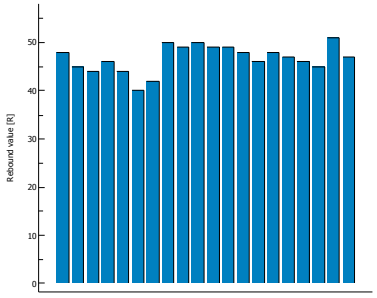
Title: AAAAAAAAAA 2461 **Date:** 25-Aug-2008 11:29 **Name:**
Remarks:



3

PROCEQ - DIGISCHMIDT (4.2, 85-2369, ND 4050)

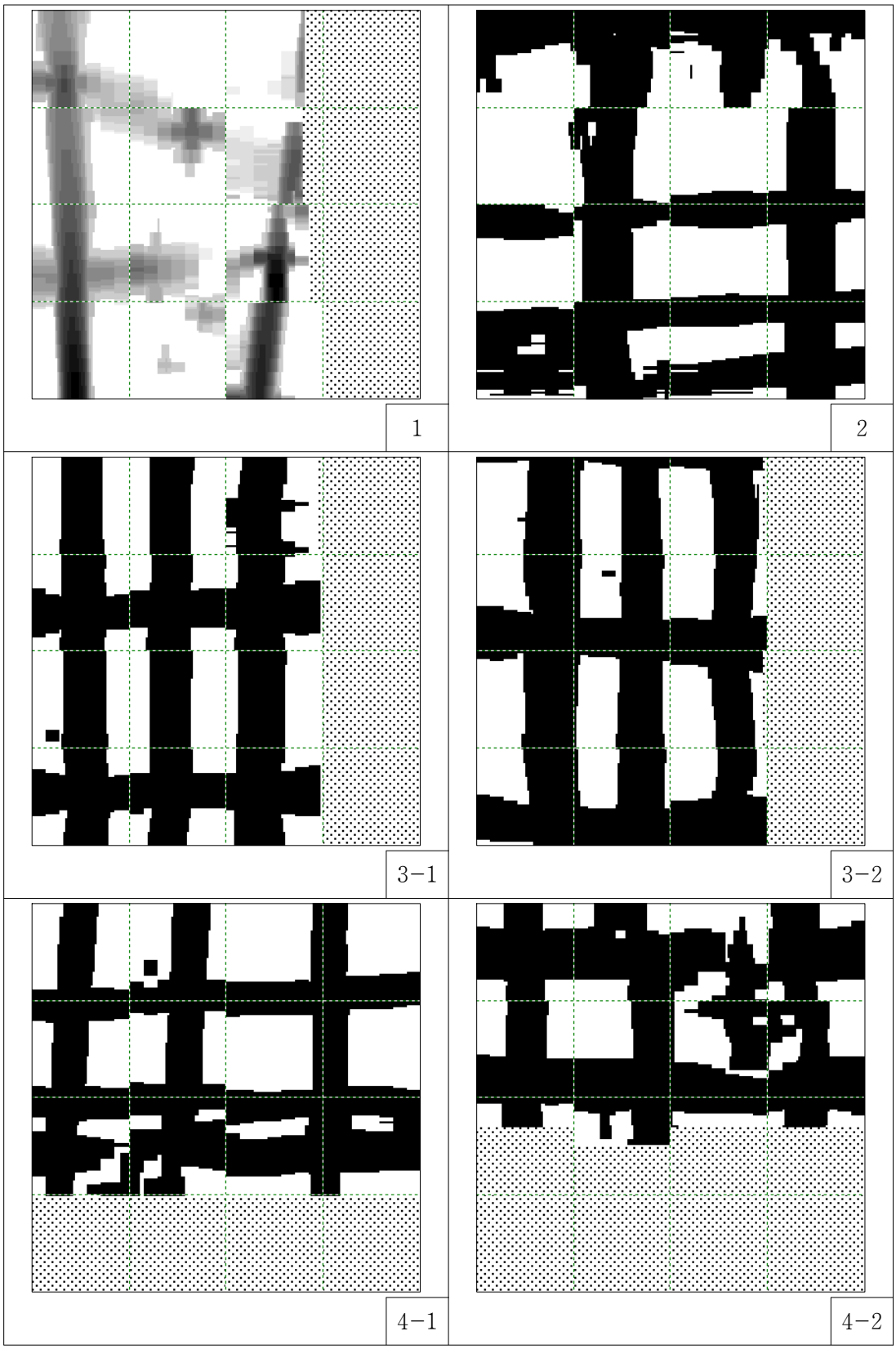
Title: AAAAAAAAAA 2462 **Date:** 25-Aug-2008 14:39 **Name:**
Remarks:



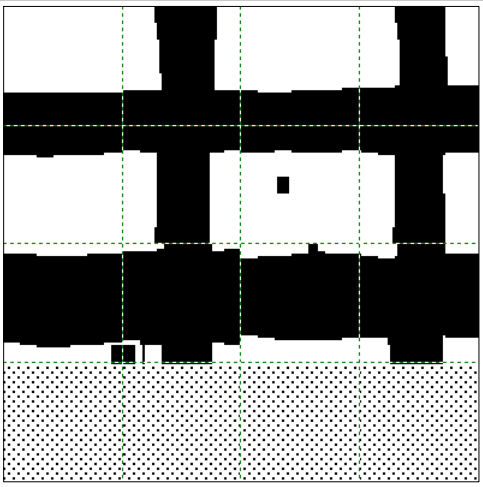
4

부록 4. FERROSCAN IMAGE

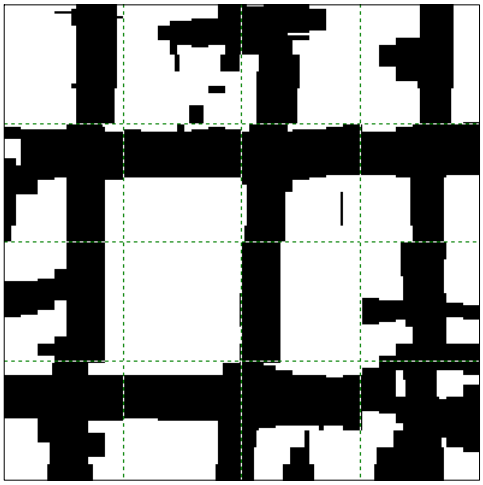
▦ 철근배근 탐사 IMAGE



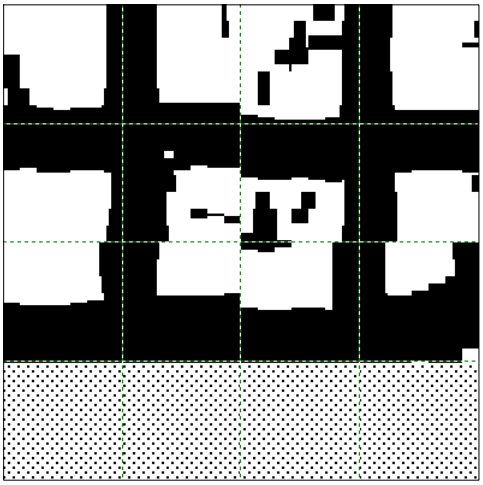
5



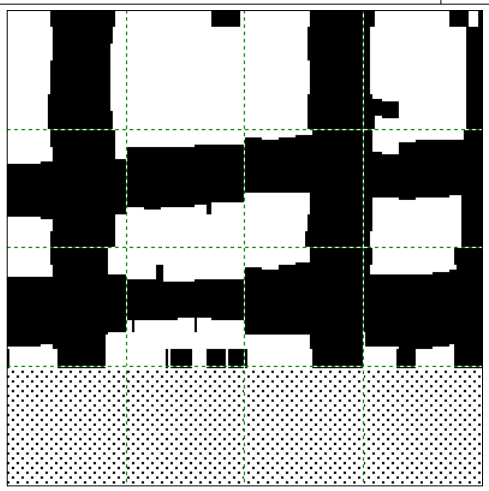
6



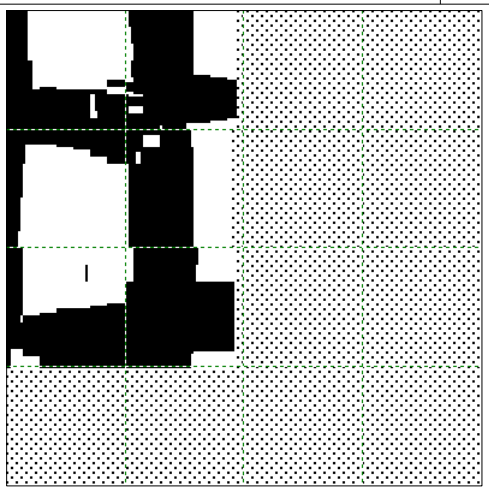
7



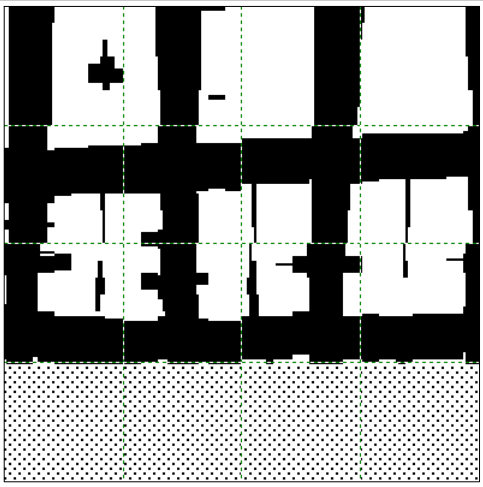
8−1



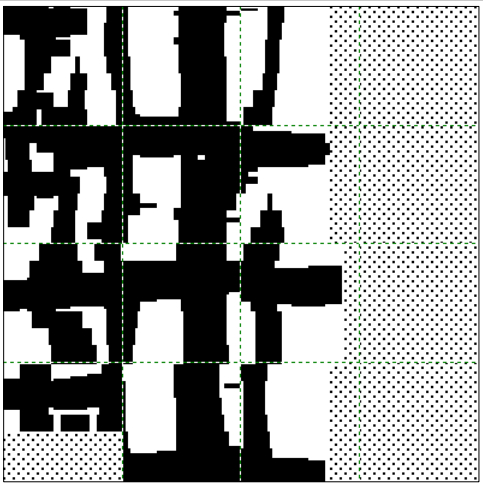
8−2



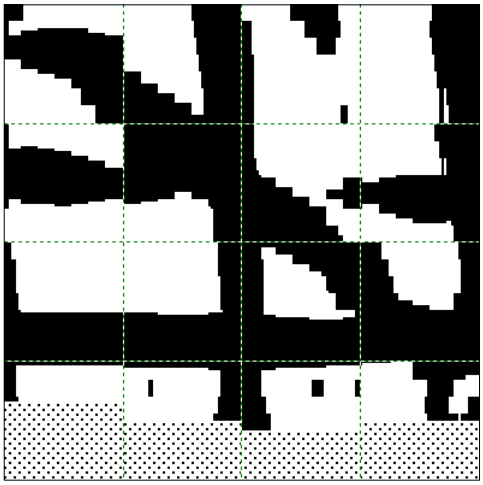
9



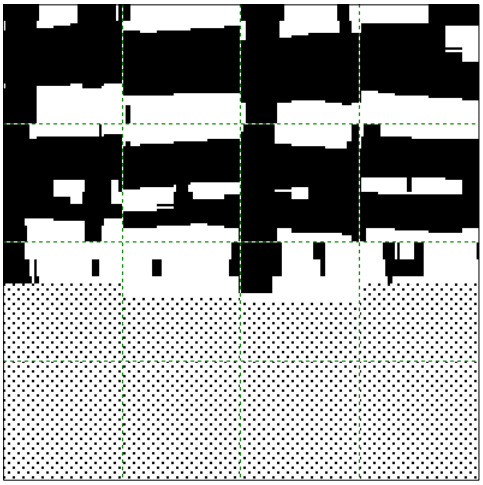
10



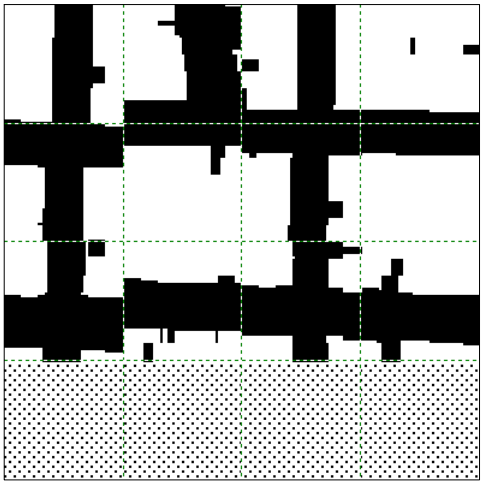
11



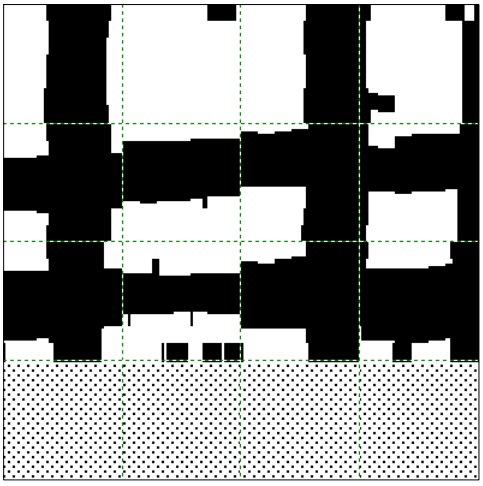
12-1



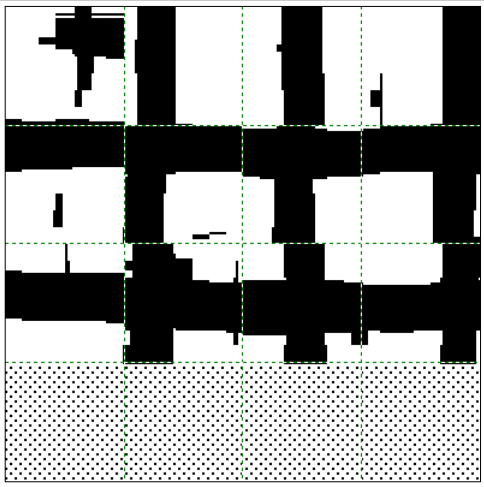
12-2



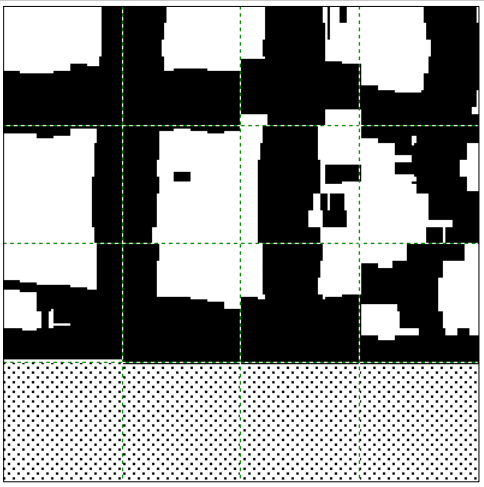
13



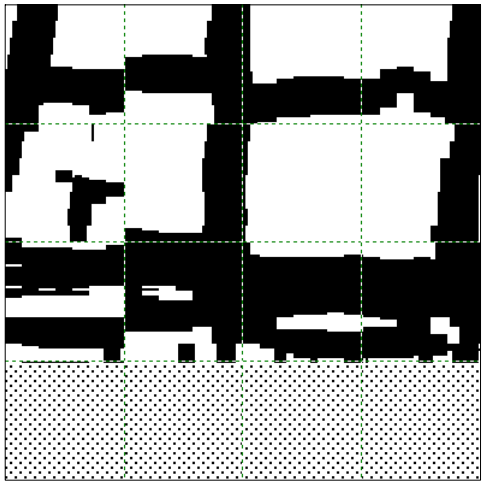
14



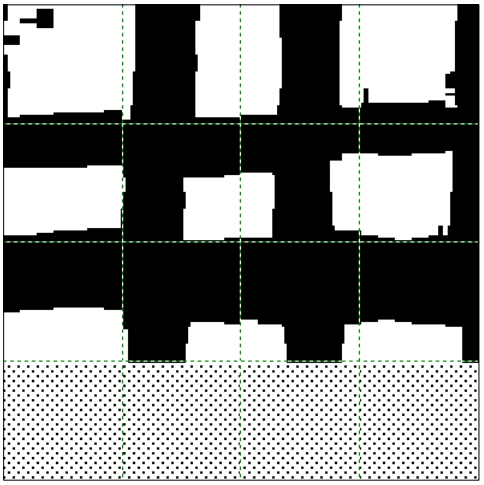
15



16



17



18

부록 5. 구조검토 근거

	Company	o	Project Name	
	Designer	o	File Name	

1. Geometry and Materials

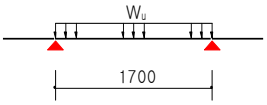
Design Code : KCI-USD99 (Build.)

Material Data : f_{ck} = 180 kgf/cm^2

f_y = 2400 kgf/cm^2

Slab Span L : 1.70 m (Both End Fixed)

Slab Depth : 120 mm (c_c = 20 mm)



2. Applied Loads

Dead Load : W_d = 0.97 tf/m^2

Live Load : W_l = 0.20 tf/m^2

W_u = 1.4*W_d+1.7*W_l= 1.70 tf/m^2

3. Check Minimum Slab Thk.

h_{min} = L/28 = 61 mm

h = h_{min}*(0.43+f_y/7000) = 47 mm

Thk = 120 > Req'd Thk = 47 mm ..... O.K.

4. Reinforcement

Strength Reduction Factor Φ = 0.900

	Short Span			Minimum
	Cont.	Cent.	DisCon	Ratio (ω_s<0.4)
M_u (tf-m/m)	0.41 (W_uL^2/12)	0.31 (W_uL^2/16)	0.00	
ρ (%)	0.209	0.156	0.000	0.200
A_{st} (cm^2/m)	2.00	1.50	0.00	2.40
D6	@ 150	@ 210	@ 400	@ 130
D6+D10	@ 250	@ 340	@ 400	@ 210
D10	@ 350	@ 400	@ 400	@ 290
D10+D13	@ 400	@ 400	@ 400	@ 400

5. Check Shear Stresses

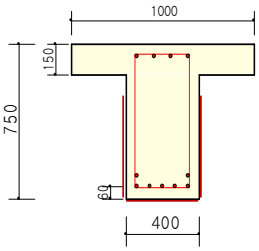
Strength Reduction Factor Φ = 0.850

V_{ux} = 1.44 < ΦV$_c$ = 5.80 tf/m ..... O.K.

	Company	.	Project Name	
	Designer	.	File Name	

1. Geometry and Materials

Design Code : KCI-USD99 (Build.)
Stress Profile : Parabolic
Material Data : f_{ck} = 180 kgf/cm^2 (β_1 = 0.850)
f_y = 2400, f_{ys} = 2400 kgf/cm^2
Section : 75 * 40 cm (hf=15, bf=100 cm)
Top Bar (Layer 1) : 4 - D22 (d_T = 6.00 cm)
Bot. Bar (Layer 1) : 5 - D22 (d_B = 6.00 cm)
Bot. Bar (Layer 2) : 2 - D22 (d_B = 11.00 cm)
Stirrups : 2 - D10 @ 200



2. Strengthening Materials

Location	W_{FRP}(mm)	T_{FRP}(mm)	f_{FRP}(tf/cm^2)	$\varepsilon_{FRP,Allow}$	Reduc.F(β)
1	400	0.501	35.5	0.015	0.7486
2	500	0.167	35.5	0.015	0.7

3. Member Force and Moment

-. M_u = 70.80 tf-m V_u = 41.90 tf

4. Check Tension Reinforcement

-. A_s = $\sum(A_{bar}+A_{FRP}*(f_{FRP}/f_y)*\beta)$ = 49.29 cm^2
-. A_s' = $\sum(A_{bar}')$ = 15.48 cm^2
-. d_c = $(A_s*\sum d_{ci})/(A_s)$ = 4.08 cm
-. d_c' = $(A_s'*\sum d_{ci})/(A_s')$ = 6.00 cm
-. d = H-d_c = 70.92 cm

-. $A_{s,min1}$ = $(0.8\sqrt{f_{ck}}/f_y)*Bd$ = 12.69 cm^2
-. $A_{s,min2}$ = $(14/f_y)*Bd$ = 16.55 cm^2
-. $A_{s,min}$ = Max[$A_{s,min1}$, $A_{s,min2}$] = 16.55 < 49.29 cm^2 ..... O.K.

-. ρ_b = $0.85\beta_1(f_{ck}/fy)*6000/(6000+f_y)$ = 0.0387
-. f_{sb}' = $6000 - d_c'/d'*(6000+f_y)$ = 5.27 tf/cm^2
-. f_{sb} = Min[f_{sb}', f_y] = 2.40 tf/cm^2
-. $A_{s,max}$ = $0.75\rho_b(H-d_c)B+A_s'*f_{sb}/f_y$ = 221.35 > 49.29 cm^2 ..... O.K.

5. Bending Moment Capacity - Before Strengthening

-. Neutral Axis Depth c = 5.56 cm

-. Compression : Concrete C_c = 72.30 tf
-. Compression : Rebar C_s = 0.00 tf
-. Tension : Rebar T_s = -72.30 tf

-. Strength Reduction Factor Φ = 0.900
-. Design Moment Strength ΦM_n = 38.34 tf-m
-. Strength Ratio : $M_u/\Phi M_n$ = 1.846 > 1.300 ..... N.G.

	Company	.	Project Name	
	Designer	.	File Name	

6. Bending Moment Capacity - After Strengthening

-. Neutral Axis Depth c = 7.74 cm

-. Compression : Concrete C_c = 99.11 tf
-. Compression : Rebar C_s = 19.21 tf
-. Tension : Rebar T_s = -65.03 tf
-. Tension : FRP T_{FRP} = -53.26 tf

-. Strength Reduction Factor Φ = 0.900
-. Design Moment Strength ΦM_n = 71.50 tf-m
-. Strength Ratio : $M_u/\Phi M_n$ = 0.990 < 1.000 ..... O.K.

7. Check Strain in FRP at Required Flexural Strength

-. Design Moment Strength ΦM_n = 70.80 tf-m
-. Neutral Axis Depth c = 8.80 cm
-. Strain in Concrete ε_c = 0.0020
-. Max. Strain in FRP ε_{FRP} = 0.0147 < $\varepsilon_{FRP,Allow}$ = 0.0150 ---> O.K.

8. Check Shear

-. Strength Reduction Factor Φ = 0.850
-. $V_c = 0.53\sqrt{f_{ck}}Bd$ = 19.22 tf
-. $V_s = A_v f_y d/s$ = 11.57 tf
-. $V_{FRP} = \beta*[2T_{FRP}f_{FRP}W_{FRP}]$ = 41.50 tf
-. $\Phi V_n = \Phi(V_c+V_s+V_{FRP})$ = 61.44 tf > V_u = 41.90 tf ---> O.K.

midas Set Beam Capacity Table [400*750]

	Company	o	Project Name	
	Designer	o	File Name	

1. Design Conditions

Design Code : KCI-USD99 (Build.)

Material Data : f_{ck} = 180 kgf/cm^2

: f_y = 2400 kgf/cm^2 f_{ys} = 2400 kgf/cm^2

Section Dim. : 40 * 75 cm (c_c = 4 cm)

2. Resisting Moment Capacity

A_s	A'_s	ΦM_n(tf-m)	d(cm)	ρ	ρ'	ω_c(mm)
2-D22	2-D22	11.45	68.94	0.0028 $A_{s,min}$	0.0028	0.2122
3-D22	2-D22	16.75	68.94	0.0042 $A_{s,min}$	0.0028	0.1854
4-D22	2-D22	22.04	68.94	0.0056 $A_{s,min}$	0.0028	0.1684
5-D22	2-D22	27.30	68.94	0.0070	0.0028	0.1564
6-D22	2-D22	32.13	68.15	0.0085	0.0028	0.1532
7-D22	2-D22	36.91	67.59	0.0100	0.0028	0.1495
8-D22	2-D22	41.60	67.17	0.0115	0.0028	0.1456
9-D22	2-D22	46.12	66.84	0.0130	0.0028	0.1419
10-D22	2-D22	50.53	66.58	0.0145	0.0028	0.1385

$A_{s,min}$ = 16.09 cm^2, $0.75\rho_b$ = 0.0290 (80.05 cm^2)

Torsional Effect is neglected if $T_u \leq$ 1.16 tf-m

3. Resisting Shear Capacity

Stirrup	ΦV_n(tf)	ΦV_c(tf)	ΦV_s(tf)	ΦV_{max}(tf)
<d = 68.94>				
2- D10 @100	36.73	16.67	20.06	83.33
2- D10 @125	32.72	16.67	16.05	83.33
2- D10 @150	30.04	16.67	13.37	83.33
2- D10 @175	28.13	16.67	11.46	83.33
2- D10 @200	26.70	16.67	10.03	83.33
2- D10 @250	24.69	16.67	8.02	83.33
2- D10 @300	23.35	16.67	6.69	83.33
<d = 66.58>				
2- D10 @100	35.47	16.10	19.38	80.48
2- D10 @125	31.60	16.10	15.50	80.48
2- D10 @150	29.01	16.10	12.92	80.48
2- D10 @175	27.17	16.10	11.07	80.48
2- D10 @200	25.78	16.10	9.69	80.48
2- D10 @250	23.85	16.10	7.75	80.48
2- D10 @300	22.55	16.10	6.46	80.48

midas Set Beam Capacity Table [300*650]

	Company	o	Project Name	
	Designer	o	File Name	

1. Design Conditions

Design Code : KCI-USD99 (Build.)

Material Data : f_{ck} = 180 kgf/cm^2

: f_y = 2400 kgf/cm^2 f_{ys} = 2400 kgf/cm^2

Section Dim. : 30 * 65 cm (c_c = 4 cm)

2. Resisting Moment Capacity

A_s	A'_s	ΦM_n(tf-m)	d(cm)	ρ	ρ'	ω_c(mm)
2-D22	2-D22	9.57	58.94	0.0044 $A_{s,min}$	0.0044	0.1928
3-D22	2-D22	14.02	58.94	0.0066	0.0044	0.1684
4-D22	2-D22	18.44	58.94	0.0088	0.0044	0.1530
5-D22	2-D22	22.44	57.99	0.0111	0.0044	0.1491
6-D22	2-D22	26.38	57.36	0.0135	0.0044	0.1444
7-D22	2-D22	30.14	56.91	0.0159	0.0044	0.1398
8-D22	2-D22	33.72	56.58	0.0182	0.0044	0.1355

$A_{s,min}$ = 10.31 cm^2, $0.75\rho_b$ = 0.0290 (51.33 cm^2)

Torsional Effect is neglected if $T_u \leq$ 0.59 tf-m

3. Resisting Shear Capacity

Stirrup	ΦV_n(tf)	ΦV_c(tf)	ΦV_s(tf)	ΦV_{max}(tf)
<d = 58.94>				
2- D10 @100	27.84	10.69	17.15	53.43
2- D10 @125	24.41	10.69	13.72	53.43
2- D10 @150	22.12	10.69	11.43	53.43
2- D10 @175	20.49	10.69	9.80	53.43
2- D10 @200	19.26	10.69	8.58	53.43
2- D10 @250	17.55	10.69	6.86	53.43
2- D10 @300<=MAX	16.40	10.69	5.72	53.43
<d = 56.58>				
2- D10 @100	26.72	10.26	16.47	51.29
2- D10 @125	23.43	10.26	13.17	51.29
2- D10 @150	21.24	10.26	10.98	51.29
2- D10 @175	19.67	10.26	9.41	51.29
2- D10 @200	18.49	10.26	8.23	51.29
2- D10 @250	16.84	10.26	6.59	51.29
2- D10 @300<=MAX	15.75	10.26	5.49	51.29

midas Set Beam Capacity Table [300*650]

	Company	o	Project Name	
	Designer	o	File Name	

1. Design Conditions

Design Code : KCI-USD99 (Build.)

Material Data : f_{ck} = 180 kgf/cm^2

: f_y = 2400 kgf/cm^2 f_{ys} = 2400 kgf/cm^2

Section Dim. : 30 * 65 cm (c_c = 4 cm)

2. Resisting Moment Capacity

A_s	A'_s	ΦM_n(tf-m)	d(cm)	ρ	ρ'	ω_c(mm)
2-D22	2-D22	9.57	58.94	0.0044 $A_{s,min}$	0.0044	0.1928
3-D22	2-D22	14.02	58.94	0.0066	0.0044	0.1684
4-D22	2-D22	18.05	57.76	0.0089	0.0044	0.1624
5-D22	2-D22	22.04	57.05	0.0113	0.0044	0.1555
6-D22	2-D22	25.98	56.58	0.0137	0.0044	0.1492

$A_{s,min}$ = 10.31 cm^2, $0.75\rho_b$ = 0.0290 (51.33 cm^2)

Torsional Effect is neglected if $T_u \leq$ 0.59 tf-m

3. Resisting Shear Capacity

Stirrup	ΦV_n(tf)	ΦV_c(tf)	ΦV_s(tf)	ΦV_{max}(tf)
<d = 58.94>				
2- D10 @100	27.84	10.69	17.15	53.43
2- D10 @125	24.41	10.69	13.72	53.43
2- D10 @150	22.12	10.69	11.43	53.43
2- D10 @175	20.49	10.69	9.80	53.43
2- D10 @200	19.26	10.69	8.58	53.43
2- D10 @250	17.55	10.69	6.86	53.43
2- D10 @300<=MAX	16.40	10.69	5.72	53.43
<d = 56.58>				
2- D10 @100	26.72	10.26	16.47	51.29
2- D10 @125	23.43	10.26	13.17	51.29
2- D10 @150	21.24	10.26	10.98	51.29
2- D10 @175	19.67	10.26	9.41	51.29
2- D10 @200	18.49	10.26	8.23	51.29
2- D10 @250	16.84	10.26	6.59	51.29
2- D10 @300<=MAX	15.75	10.26	5.49	51.29

Slab Capacity Table

	Company	o	Project Name	
	Designer	o	File Name	

1. Design Conditions

Design Code : KCI-USD99 (Build.)

Material Data : f_{ck} = 180 kgf/cm^2

: f_y = 2400 kgf/cm^2

Concrete Clear Cover : 2 cm

2. Slab Thk : 120 mm

Short Direction Moment (Unit : tf-m/m)

	@ 100	@ 120	@ 150	@ 180	@ 200	@ 250	@ 300	@ 350
D10	1.38	1.16	0.94	0.79	0.71	0.57	0.48	0.41
D10+D13	1.85	1.57	1.27	1.07	0.97	0.78	0.65	0.56
D13	2.29	1.95	1.59	1.34	1.21	0.98	0.82	0.71
D13+D16	2.81	2.41	1.97	1.67	1.52	1.23	1.04	0.90
D16	3.28	2.83	2.33	1.99	1.81	1.47	1.24	1.07

Long Direction Moment

	@ 100	@ 120	@ 150	@ 180	@ 200	@ 250	@ 300	@ 350
D10	1.21	1.02	0.83	0.69	0.63	0.50	0.42	0.36
D10+D13	1.60	1.36	1.10	0.93	0.84	0.68	0.57	0.49
D13	1.94	1.66	1.36	1.15	1.04	0.84	0.71	0.61
D13+D16	2.34	2.01	1.66	1.41	1.28	1.04	0.88	0.76
D16	2.67	2.31	1.93	1.65	1.50	1.23	1.04	0.90

ΦV_c = 5.66 tf/m

3. Slab Thk : 150 mm

Short Direction Moment (Unit : tf-m/m)

	@ 100	@ 120	@ 150	@ 180	@ 200	@ 250	@ 300	@ 350
D10	1.84	1.55	1.25	1.05	0.94	0.76	0.63	0.54
D10+D13	2.49	2.10	1.70	1.43	1.29	1.04	0.87	0.75
D13	3.11	2.63	2.13	1.80	1.62	1.31	1.10	0.94
D13+D16	3.87	3.28	2.68	2.26	2.05	1.65	1.39	1.20
D16	4.57	3.90	3.19	2.70	2.45	1.99	1.67	1.44

Long Direction Moment

	@ 100	@ 120	@ 150	@ 180	@ 200	@ 250	@ 300	@ 350
D10	1.67	1.41	1.13	0.95	0.86	0.69	0.58	0.50
D10+D13	2.24	1.89	1.53	1.29	1.16	0.94	0.78	0.67
D13	2.76	2.34	1.90	1.60	1.45	1.17	0.98	0.85
D13+D16	3.39	2.89	2.36	2.00	1.81	1.46	1.23	1.06
D16	3.95	3.39	2.78	2.36	2.14	1.74	1.47	1.27

ΦV_c = 7.47 tf/m

	Company	o	Project Name	
	Designer	o	File Name	

1. Geometry and Materials

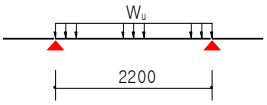
Design Code : KCI-USD99 (Build.)

Material Data : f_{ck} = 180 kgf/cm^2

f_y = 2400 kgf/cm^2

Slab Span L : 2.20 m (Both End Fixed)

Slab Depth : 150 mm (c_c = 20 mm)



2. Applied Loads

Dead Load : W_d = 0.74 tf/m^2

Live Load : W_l = 0.20 tf/m^2

$W_u = 1.4*W_d+1.7*W_l$ = 1.38 tf/m^2

3. Check Minimum Slab Thk.

h_{min} = L/28 = 79 mm

$h = h_{min}*(0.43+f_y/7000)$ = 61 mm

Thk = 150 > Req'd Thk = 61 mm ..... O.K.

4. Reinforcement

Strength Reduction Factor Φ = 0.900

	Short Span			Minimum
	Cont.	Cent.	DisCon	Ratio (ω_s<0.4)
M_u (tf-m/m)	0.55 (W_uL^2/12)	0.42 (W_uL^2/16)	0.00	
ρ (%)	0.164	0.122	0.000	0.200
A_{st} (cm^2/m)	2.07	1.54	0.00	3.00
D6	@ 150	@ 200	@ 400	@ 100
D6+D10	@ 240	@ 330	@ 400	@ 170
D10	@ 340	@ 400	@ 400	@ 230
D10+D13	@ 400	@ 400	@ 400	@ 330

5. Check Shear Stresses

Strength Reduction Factor Φ = 0.850

V_{ux} = 1.51 < ΦV_c = 7.62 tf/m ..... O.K.

	Company	o	Project Name	
	Designer	o	File Name	

1. Geometry and Materials

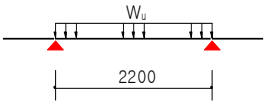
Design Code : KCI-USD99 (Build.)

Material Data : f_{ck} = 180 kgf/cm^2

f_y = 2400 kgf/cm^2

Slab Span L : 2.20 m (Both End Fixed)

Slab Depth : 150 mm (c_c = 20 mm)



2. Applied Loads

Dead Load : W_d = 0.94 tf/m^2

Live Load : W_l = 0.20 tf/m^2

$W_u = 1.4*W_d+1.7*W_l$ = 1.66 tf/m^2

3. Check Minimum Slab Thk.

h_{min} = L/28 = 79 mm

$h = h_{min}*(0.43+f_y/7000)$ = 61 mm

Thk = 150 > Req'd Thk = 61 mm ..... O.K.

4. Reinforcement

Strength Reduction Factor Φ = 0.900

	Short Span			Minimum
	Cont.	Cent.	DisCon	Ratio (ω_s<0.4)
M_u (tf-m/m)	0.67 (W_uL^2/12)	0.50 (W_uL^2/16)	0.00	
ρ (%)	0.198	0.148	0.000	0.200
A_{st} (cm^2/m)	2.49	1.86	0.00	3.00
D6	@ 120	@ 170	@ 400	@ 100
D6+D10	@ 200	@ 270	@ 400	@ 170
D10	@ 280	@ 380	@ 400	@ 230
D10+D13	@ 390	@ 400	@ 400	@ 330

5. Check Shear Stresses

Strength Reduction Factor Φ = 0.850

V_{ux} = 1.82 < ΦV_c = 7.62 tf/m ..... O.K.

	Company	o	Project Name	
	Designer	o	File Name	

1. Geometry and Materials

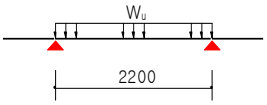
Design Code : KCI-USD99 (Build.)

Material Data : f_{ck} = 180 kgf/cm^2

f_y = 2400 kgf/cm^2

Slab Span L : 2.20 m (Both End Fixed)

Slab Depth : 150 mm (c_c = 20 mm)



2. Applied Loads

Dead Load : W_d = 1.04 tf/m^2

Live Load : W_l = 0.20 tf/m^2

$W_u = 1.4*W_d+1.7*W_l$ = 1.80 tf/m^2

3. Check Minimum Slab Thk.

h_{min} = L/28 = 79 mm

$h = h_{min}*(0.43+f_y/7000)$ = 61 mm

Thk = 150 > Req'd Thk = 61 mm ..... O.K.

4. Reinforcement

Strength Reduction Factor Φ = 0.900

	Short Span			Minimum
	Cont.	Cent.	DisCon	Ratio (ω_s<0.4)
M_u (tf-m/m)	0.72 (W_uL^2/12)	0.54 (W_uL^2/16)	0.00	
ρ (%)	0.215	0.160	0.000	0.200
A_{st} (cm^2/m)	2.71	2.02	0.00	3.00
D6	@ 110	@ 150	@ 400	@ 100
D6+D10	@ 190	@ 250	@ 400	@ 170
D10	@ 260	@ 350	@ 400	@ 230
D10+D13	@ 360	@ 400	@ 400	@ 330

5. Check Shear Stresses

Strength Reduction Factor Φ = 0.850

V_{ux} = 1.98 < ΦV_c = 7.62 tf/m ..... O.K.

	Company	o	Project Name	
	Designer	o	File Name	

1. Geometry and Materials

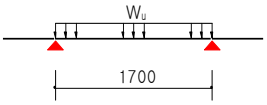
Design Code : KCI-USD99 (Build.)

Material Data : f_{ck} = 180 kgf/cm^2

f_y = 2400 kgf/cm^2

Slab Span L : 1.70 m (Both End Fixed)

Slab Depth : 120 mm (c_c = 20 mm)



2. Applied Loads

Dead Load : W_d = 0.67 tf/m^2

Live Load : W_l = 0.20 tf/m^2

W_u = 1.4*W_d+1.7*W_l= 1.28 tf/m^2

3. Check Minimum Slab Thk.

h_{min} = L/28 = 61 mm

h = h_{min}*(0.43+f_y/7000) = 47 mm

Thk = 120 > Req'd Thk = 47 mm ..... O.K.

4. Reinforcement

Strength Reduction Factor Φ = 0.900

	Short Span			Minimum
	Cont.	Cent.	DisCon	Ratio (ω_s<0.4)
M_u (tf-m/m)	0.31 (W_uL^2/12)	0.23 (W_uL^2/16)	0.00	
ρ (%)	0.156	0.117	0.000	0.200
A_{st} (cm^2/m)	1.50	1.12	0.00	2.40
D6	@ 210	@ 280	@ 400	@ 130
D6+D10	@ 340	@ 400	@ 400	@ 210
D10	@ 400	@ 400	@ 400	@ 290
D10+D13	@ 400	@ 400	@ 400	@ 400

5. Check Shear Stresses

Strength Reduction Factor Φ = 0.850

V_{ux} = 1.09 < ΦV$_c$ = 5.80 tf/m ..... O.K.

	Company	o	Project Name	
	Designer	o	File Name	

1. Geometry and Materials

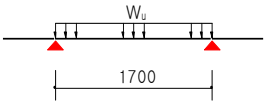
Design Code : KCI-USD99 (Build.)

Material Data : f_{ck} = 180 kgf/cm^2

f_y = 2400 kgf/cm^2

Slab Span L : 1.70 m (Both End Fixed)

Slab Depth : 120 mm (c_c = 20 mm)



2. Applied Loads

Dead Load : W_d = 0.87 tf/m^2

Live Load : W_l = 0.20 tf/m^2

$W_u = 1.4*W_d+1.7*W_l$ = 1.56 tf/m^2

3. Check Minimum Slab Thk.

h_{min} = L/28 = 61 mm

h = $h_{min}*(0.43+f_y/7000)$ = 47 mm

Thk = 120 > Req'd Thk = 47 mm ..... O.K.

4. Reinforcement

Strength Reduction Factor Φ = 0.900

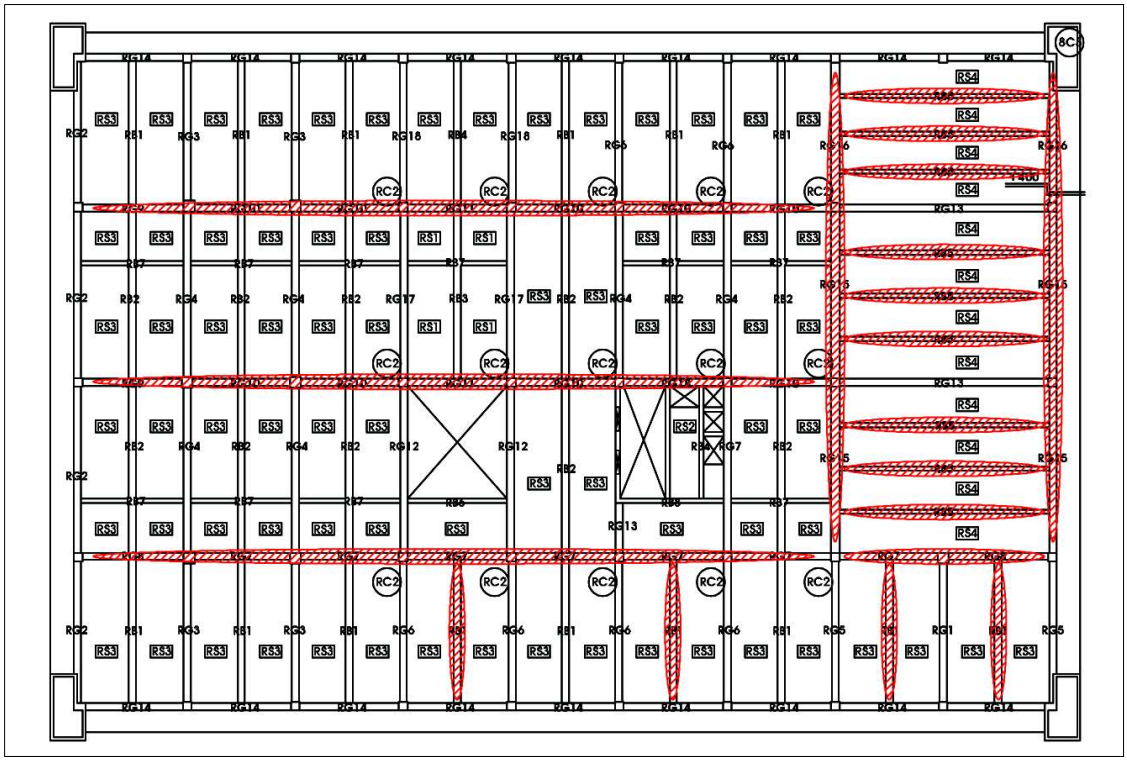
	Short Span			Minimum
	Cont.	Cent.	DisCon	Ratio (ω_s<0.4)
M_u (tf-m/m)	0.38 (W_uL^2/12)	0.28 (W_uL^2/16)	0.00	
ρ (%)	0.191	0.143	0.000	0.200
A_{st} (cm^2/m)	1.84	1.37	0.00	2.40
D6	@ 170	@ 230	@ 400	@ 130
D6+D10	@ 280	@ 370	@ 400	@ 210
D10	@ 380	@ 400	@ 400	@ 290
D10+D13	@ 400	@ 400	@ 400	@ 400

5. Check Shear Stresses

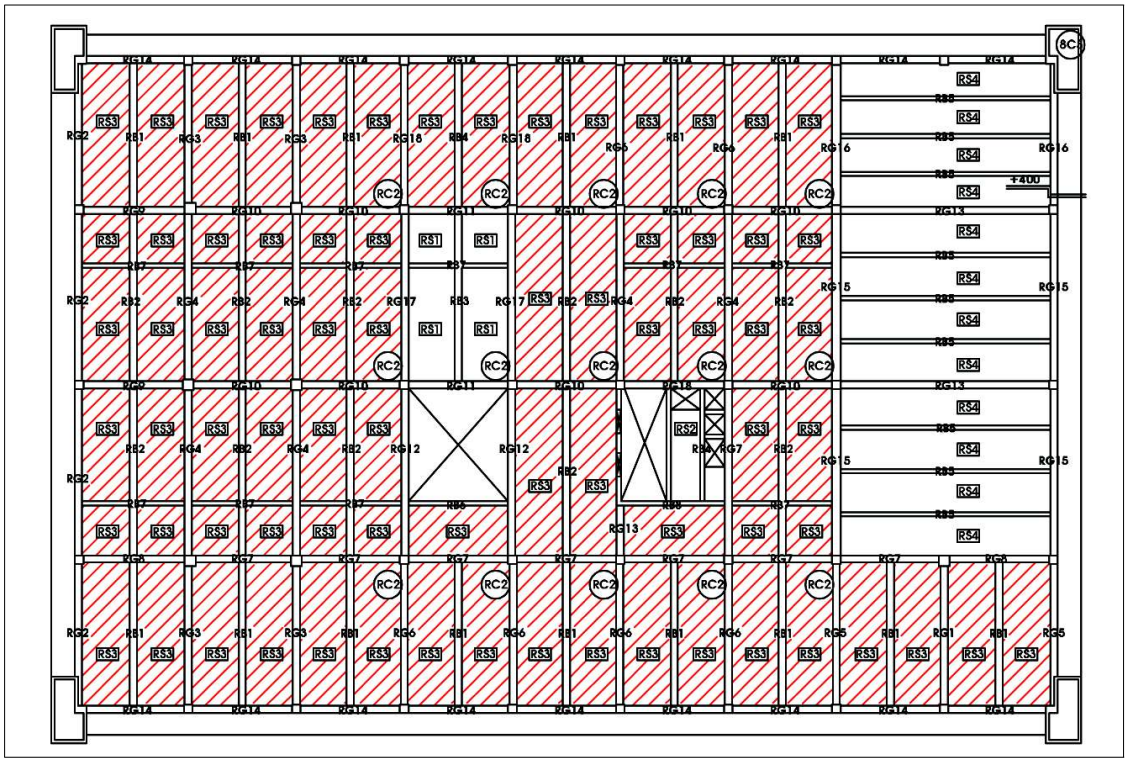
Strength Reduction Factor Φ = 0.850

V_{ux} = 1.32 < ΦV_c = 5.80 tf/m ..... O.K.

부록 6. 보강 위치도



[그림 6] 지붕층 바닥 보 보강위치도



[그림 7] 지붕층 바닥 슬래브 보강위치도

부록 7. 건축물 대장