LAMPIRAN 1
PRELIMINARY DESAIN

L1.1 *Preliminary* Pelat Lantai

- Beban Mati Tambahan (SDL):

Spesi	= 2 x 21 kg/m^2	=	42 kg/m^2
Keramik	= 1 x 24 kg/m^2	=	24 kg/m^2
Plafond + Penggantung		=	18 kg/m^2
Mekanikal & Elektrikal		=	20 kg/m^2
	Total SDL	=	104 kg/m^2

- Beban Hidup (LL) = 200 kg/m^2

Kombinasi Pembebanan

- q_{ult1} = 1,4 q_{DL} = 1,4 (104) = 145,6 kg/m^2
- q_{ult2} = 1,2 q_{DL} + 1,6q_{LL} = 1,2 (104) +1,6(200) = 444,8 kg/m^2

$\therefore$ Digunakan q_{ult2} = 444,8 kg/m^2

Menentukan Profil Pelat Prategang

- HCS

  Type : 120.05.14

  Spesifikasi : - Tebal = 120 mm
  - Diameter Lubang = 5 mm
  - Jumlah Lubang = 14 Buah
  - Daya Dukung = 500 kg/m^2

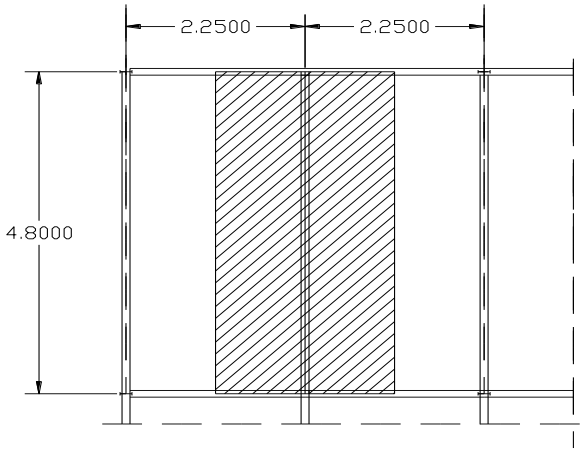
- Panjang Bentang = 4,5 m

(Notes : Berat sendiri Pelat Beton Prategang 29%-42% lebih ringan dari pelat lantai beton konvesional)

L1.2 *Preliminary* Balok

1. Balok (D-E-6 lt.1)

Balok Anak



Beban mati

Beban yang bekerja pada balok akibat pelat lantai

Berat sendiri pelat beton(t = 15cm = 0,15m)

= 0,12m x 2400 kg/m^3 x 70% q_{DL} = 201,6 kg/m²

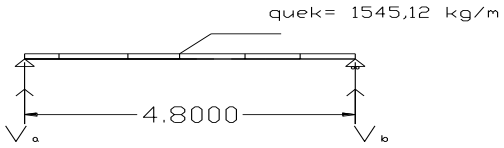
finishing, M.E q_{SDL} = 104 kg/m²

Beban hidup

q_{LL} = 200 kg/m²

$$q_u = 1{,}2(q_{DL} + q_{SDL}) + 1{,}6q_{LL} = 1{,}2(201{,}6 + 104) + 1{,}6(200) = 686{,}72 \text{ kg/m²}$$

$$q_{uek} = q_u \times \left(\frac{2{,}25 + 2{,}25}{2} \right) = 686{,}72 kg/m^2 \times 2{,}25 m = 1545{,}12 \text{ kg/m}$$



$$M_{\max} = \frac{1}{8} \times q_{uek} \times L^2 = \frac{1}{8} \times 1545{,}12 kg/m \times (4{,}8m)^2 = 4349{,}9456 \text{ kgm}$$

= 43499456 Nmm

$$V_A = V_B = \frac{1}{2} \times q_{uek} \times L = \frac{1}{2} \times 1545{,}12 kg/m \times (4{,}8m) = 3708{,}288 \text{ kg}$$

= 37082,88 N

$M_u \leq \phi M_n$;dimana $M_n = M_p = 1{,}5\ M_y$ dan $\phi = 0{,}9$; $M_y = f_y * z_x$

$$z_x \geq \frac{M_u}{\phi * 1{,}5 * f_y} = \frac{44499456}{0{,}9 * 1{,}5 * 250} = 131850{,}24 \text{ mm}^3 = 131{,}85 \text{ cm}^3$$

Pilih profil IWF 200.100.5,5.8 → S_x = 184 cm³

A = 27,16 cm²

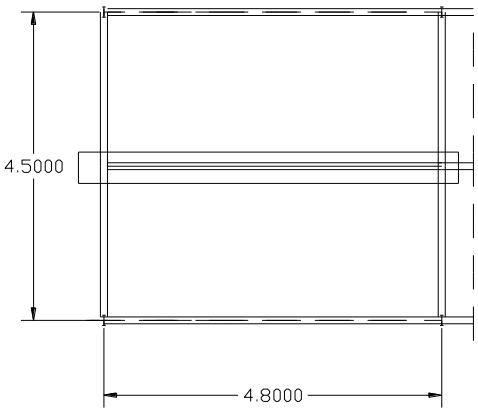
I_x =1840 cm^4

q = 21,3 kg/m

$$M_n = M_p = f_y * z_x = 250 * 194737{,}2 = 48684300 \text{ Nmm}$$

$$\phi M_n = 0{,}9 * 48684300 = 43815870 \text{ Nmm} > 43499456 \text{ Nmm...} \text{ (memenuhi)}$$

Balok Induk



$$\Sigma V_{B.anak} = 2 \times 3708{,}288 = 7416{,}576 \text{ kg}$$

$$V_{B.induk} = {7416{,}576}/{2} = 3708{,}288 \text{ kg}$$

$$M_{\max} = \frac{1}{8} \times V_{B.anak} \times L = \frac{1}{8} \times 7416{,}576kg \times (4{,}8m) = 4349{,}9456 \text{ kgm}$$

= 43499456 Nmm

$M_u \leq \phi M_n$;dimana $M_n = M_p = 1{,}5\ M_y$ dan $\phi = 0{,}9$; $M_y = f_y * z_x$

$$z_x \geq \frac{M_u}{\phi * 1{,}5 * f_y} = \frac{44499456}{0{,}9 * 1{,}5 * 250} = 131850{,}24 \text{ mm}^3 = 131{,}85 \text{ cm}^3$$

Pilih profil IWF 200.100.5,5.8 → S_x = 184 cm³

A = 27,16 cm²

I_x =1840 cm^4

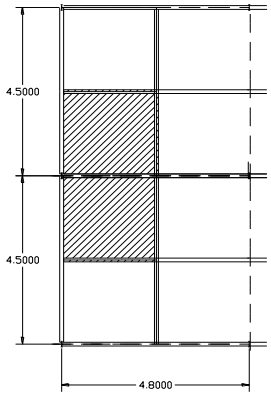
q = 21,3 kg/m

$M_n = M_p = f_y \cdot z_x = 250 \cdot 194737{,}2 = 48684300$ Nmm

$\phi M_n = 0{,}9 \cdot 48684300 = 43815870$ Nmm > 43499456 Nmm... (memenuhi)

L1.3 *Preliminary* Kolom

(Kolom 3-A lt. 1)



Kolom lantai 5

Pembebanan :

Beban lantai (1,2DL + 1,6LL)

= [1,2(201,6kg/m^2+104kg/m^2)+1,6(100kg/m^2)]*4,5m*(2,4m+2,4m)

=11377,152 kg

Berat balok anak = 1,2 (2,4m)*21,3 kg/m = 61,344 kg

Berat balok induk = 1,2((2,4m+2,4m)+4,5m)*21,3kg/m = 237,708 kg

Total =11676,204 kg

Beban gravitasi yang diterima kolom (Pu) :

Pu,4 = 11676,204 kg

= 116762,04 N

$N_u \leq \emptyset N_n$; dimana $N_n = A_g * f_y$ dan Ø = 0,85

$$A \geq \frac{N_u}{\phi * f_y} = \frac{116762,04}{0,85 * 250} = 549,468 \text{ mm}^2 = 5,495 \text{ cm}^2$$

Diambil profil IWF 400.200.8.13 → A = 84,1 cm²

q = 66 kg/m

Kolom lantai 4

Pembebanan :

Transfer beban dari kolom lantai 5

Beban kolom lantai 5 + berat kolom lantai 5

Pu,5tot = 11676,204 kg + 1,2(q*H5) = 11676,204 +1,2(66*3,4)

= 11945,484 kg

Beban lantai (1,2DL + 1,6LL)

= [1,2(201,6kg/m^2+104kg/m^2)+1,6(200kg/m^2)]*4,5m*(2,4m+2,4m)

=14833,152 kg

Berat balok induk =1,2((2,4m+2,4m)+4,8m)*21,3kg/m = 237,708 kg

Berat balok anak = 1,2 (2,4)*21,3 = 61,344 kg

Total =15132,204 kg

Beban gravitasi yang diterima kolom (Pu) :

Pu,4 = 11945,484 + 15132,204

= 27077,688 kg

= 270776,88 N

$N_u \leq \emptyset N_n$; dimana $N_n = A_g * f_y$ dan Ø = 0,85

$$A \geq \frac{N_u}{\phi * f_y} = \frac{270776,88}{0,85 * 250} = 1274,244 \text{ mm}^2 = 12,742 \text{ cm}^2$$

Diambil profil IWF 500.200.10.16 →A = 114,2 cm²

q = 89,6 kg/m

Kolom lantai 3

Pembebanan :

Transfer beban dari kolom lantai 4

Beban kolom lantai 4 + berat kolom lantai 4

Pu,5tot = 27077,688kg + 1,2(q*H4) = 27077,688 +1,2(89,6*3,4)

= 27443,256 kg

Beban lantai (1,2DL + 1,6LL)

= [1,2(201,6kg/m^2+104kg/m^2)+1,6(200kg/m^2)]*4,5m*(2,4m+2,4m)

=14833,152 kg

Berat balok induk =1,2((2,4m+2,4m)+4,8m)*21,3kg/m = 237,708 kg

Berat balok anak = 1,2 (2,4)*21,3 = 61,344 kg

Total =15132,204 kg

Beban gravitasi yang diterima kolom (Pu) :

Pu,3 = 27443,256 + 15132,204

= 42575,46 kg

= 425754,6 N

$N_u \leq \emptyset N_n$; dimana $N_n = A_g * f_y$ dan Ø = 0,85

$$A \geq \frac{N_u}{\phi * f_y} = \frac{425754,6}{0,85 * 250} = 2003,551 \text{ mm}^2 = 20,035 \text{ cm}^2$$

Diambil profil IWF 600.300.12.20 → A = 192,5 cm²

q = 151 kg/m

Kolom lantai 2

Pembebanan :

Transfer beban dari kolom lantai 3

Beban kolom lantai 3 + berat kolom lantai 3

Pu,5tot = 42575,46kg + 1,2(q*H5) = 42575,46kg +1,2(151kg/m*3,4m)

= 43191,54 kg

Beban lantai (1,2DL + 1,6LL)

= [1,2(201,6kg/m^2+104kg/m^2)+1,6(200kg/m^2)]*4,5m*(2,4m+2,4m)

=14833,152 kg

Berat balok induk =1,2((2,4m+2,4m)+4,8m)*21,3kg/m = 237,708 kg

Berat balok anak = 1,2 (2,4)*21,3 = 61,344 kg

Total =15132,204

Beban gravitasi yang diterima kolom (Pu) :

Pu,4 = 43191,54 + 15132,204

= 58323,744 kg

= 583237,44 N

$N_u \leq \emptyset N_n$; dimana $N_n = A_g * f_y$ dan Ø = 0,85

$$A \geq \frac{N_u}{\phi * f_y} = \frac{583237,44}{0,85 * 250} = 2744,647 \text{ mm}^2 = 27,446 \text{ cm}^2$$

Diambil profil IWF 800.300.14.26 → A = 267,4 cm²

q = 210 kg/m

Kolom lantai 1

Pembebanan :

Transfer beban dari kolom lantai 2

Beban kolom lantai 2 + berat kolom lantai 2

Pu,5tot =58323,744 kg+1,2 (q*H2) =58323,744kg+1,2(267,4kg/m*3,4m)
= 59414,736 kg

Beban lantai (1,2DL + 1,6LL)

= [1,2(201,6kg/m^2+104kg/m^2)+1,6(200kg/m^2)]*4,5m*(2,4m+2,4m)
=14833,152 kg

Berat balok induk =1,2((2,4m+2,4m)+4,8m)*21,3kg/m = 237,708 kg

Berat balok anak = 1,2 (2,4)*21,3 = 61,344 kg

Total =15132,204 kg

Beban gravitasi yang diterima kolom (Pu) :

Pu,1 = 59414,736 + 15132,204

= 74546,94 kg

= 745469,4 N

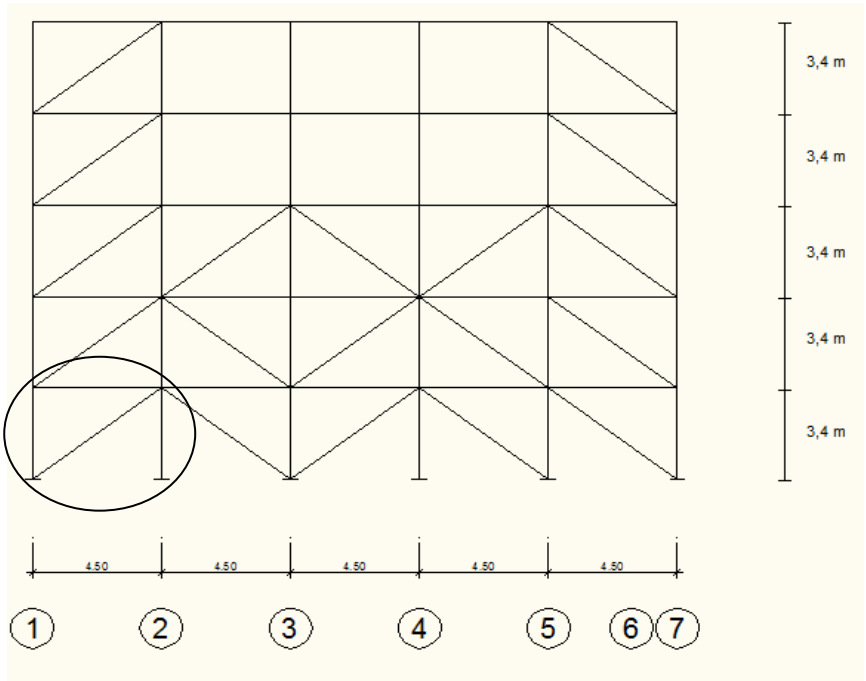
$N_u \leq \emptyset N_n$; dimana $N_n = A_g * f_y$ dan Ø = 0,85

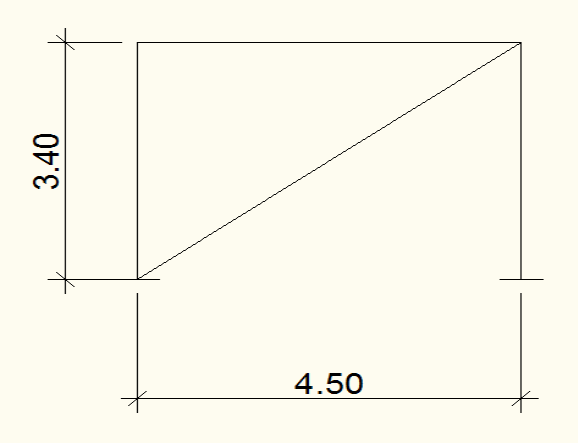
$$A \geq \frac{N_u}{\phi * f_y} = \frac{745469,4}{0,85 * 250} = 3508,091 \text{ mm}^2 = 35,081 \text{ cm}^2$$

Diambil profil IWF 800.300.14.26 → A = 267,4 cm²

q = 210 kg/m

L1.4 *Preliminary* bresing





Perhitungan bresing :

P_{cr} = 1051636332,89 N

$$A_b = \frac{\left[1+\left(\frac{L}{h}\right)^2\right]^{3/2} \cdot \Sigma P_n}{\left(\frac{L}{h}\right)^2 \cdot E} = \frac{\left[1+\left(\frac{4500}{3400}\right)^2\right]^{3/2} \cdot 2(1051636332,89)}{\left(\frac{4500}{3400}\right)^2 \cdot 200000} = 362,693mm$$

Required horizontal brace force :

$$P_{br} \geq 0,004P_r$$

Requied strength P_r

$$P_r = \Sigma \phi P_n = 2(0,9) \cdot (105136332,89) = 189245399,2N$$

$$P_{br} = 0,004P_r = 0,004 \cdot 189245399,2 = 756981,598$$

Required horizontal stiffness for the brace :

$$\beta_{br} = \frac{1}{\phi}\left(\frac{2 \cdot P_r}{L_b}\right) = \frac{1}{0{,}75} \cdot \left(\frac{2 \cdot 105136332{,}89}{3400}\right) = 82459{,}869 N / mm$$

$$\beta_{br} = \frac{A_{br} \cdot E}{L_{br}} \cdot \cos\theta = 82459{,}869 N / mm$$

$$A_{br} = \frac{82459{,}869(5882{,}1765)}{200000\left(\frac{4500}{5882{,}1765}\right)^2} = 4143{,}828 mm$$

Dipakai

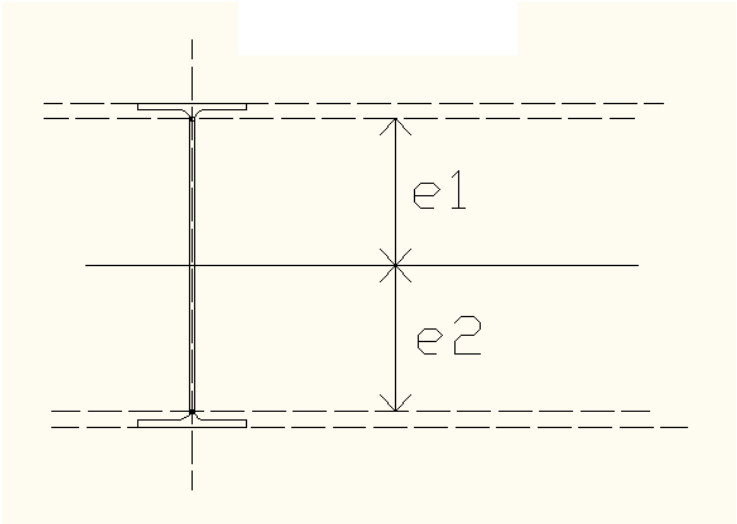
IWF 200.200.8.12 → A_g = 63,53 cm^2 = 6353 mm^2

$A_g \geq A_{br}$

6353 $mm^2 \geq$ 4143,828 $mm^2 \rightarrow$ (OK)

L1.5 Modulus Penampang Plastis (Z) wide flange "IWF"

Profil IWF 200.100.5,5.8



Arah Y

No	A (Luas)	x (titik berat)	Δx = A . x
1	400	50	20000
2	506	2	1012
3	400	50	20000
Σ	1306		41012

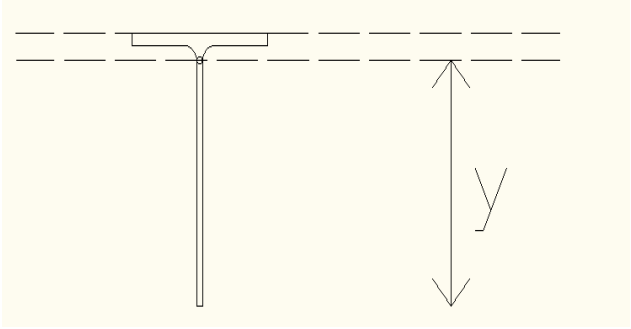
$x = \Delta x / A = 41012/1306$

$x_1 = x_2 = 31{,}40276$ mm = 3,14 cm

$Z_y = 0{,}5A_t . (x_1+x_2)$

$Z_y = 6{,}53 . (3{,}140276+3{,}140276)$

$Z_y = 41{,}012\ cm^3 = 41012\ mm^3$



$Z_x = A \cdot y$

$Z_x = 2716 \cdot 71{,}7 = 194737{,}2\ mm^3$

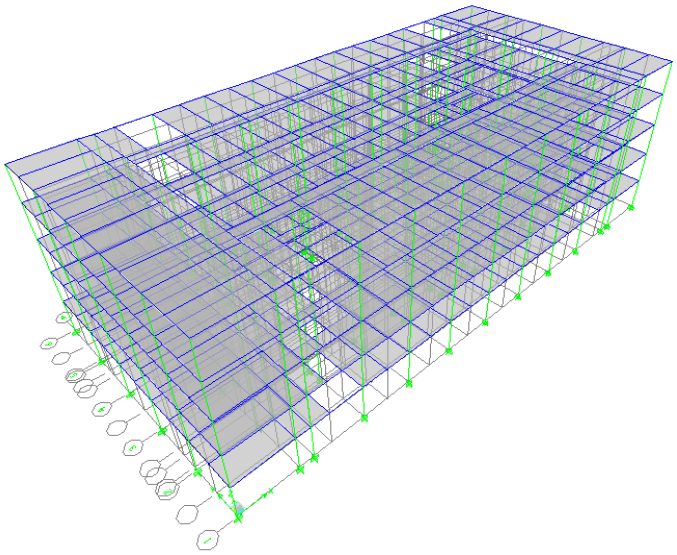
LAMPIRAN 2

HASIL *OUTPUT* PERANGKAT LUNAK

L2.1 Hasil Analisis Struktur

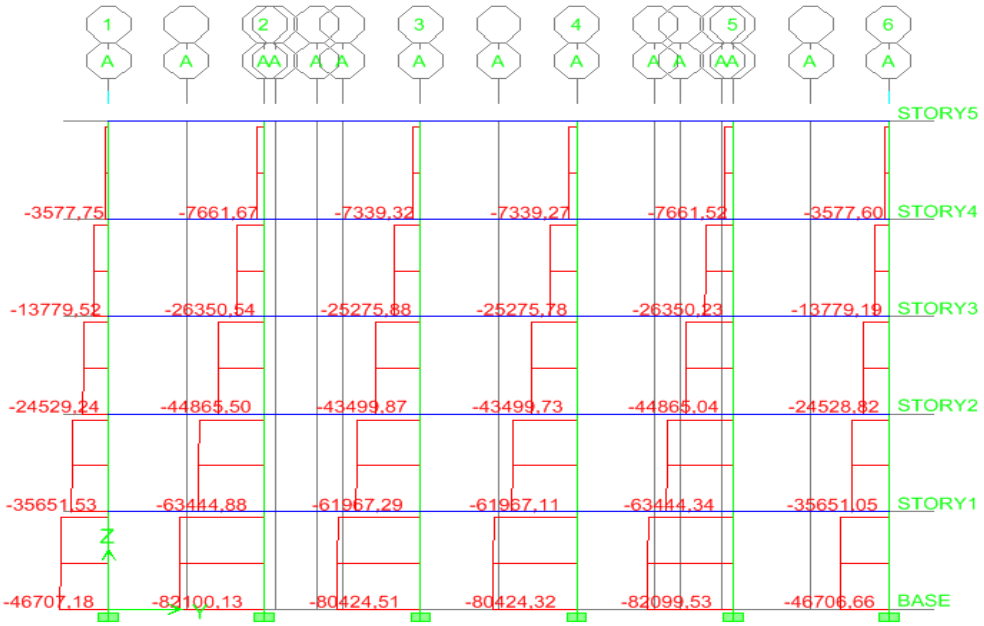
Analisis

1. Gedung A

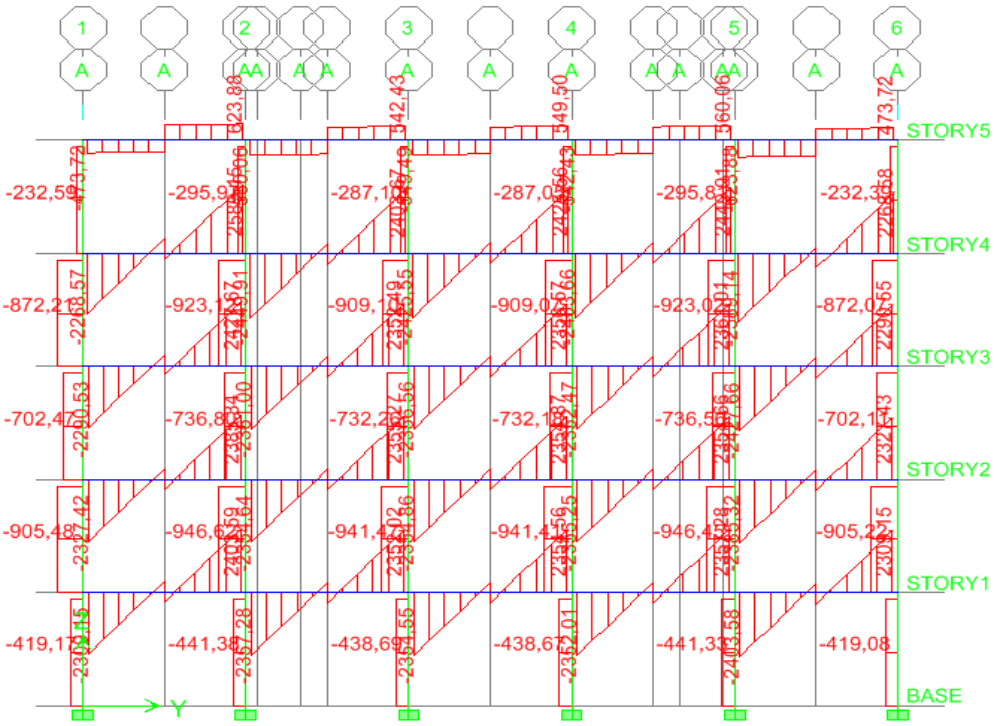


Tampilan hasil analisis :

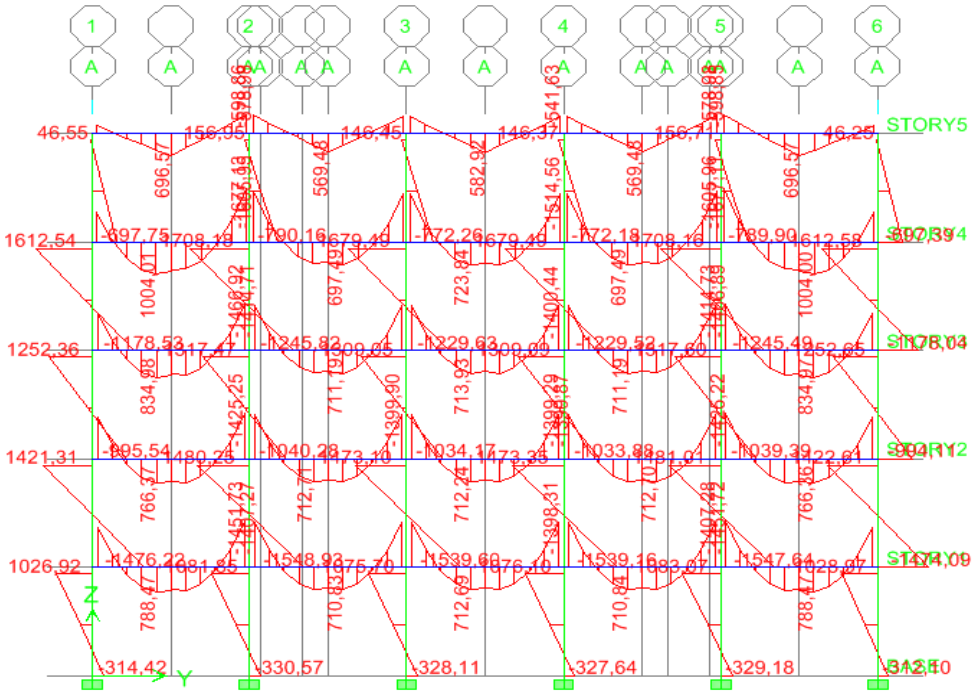
- Gaya aksial



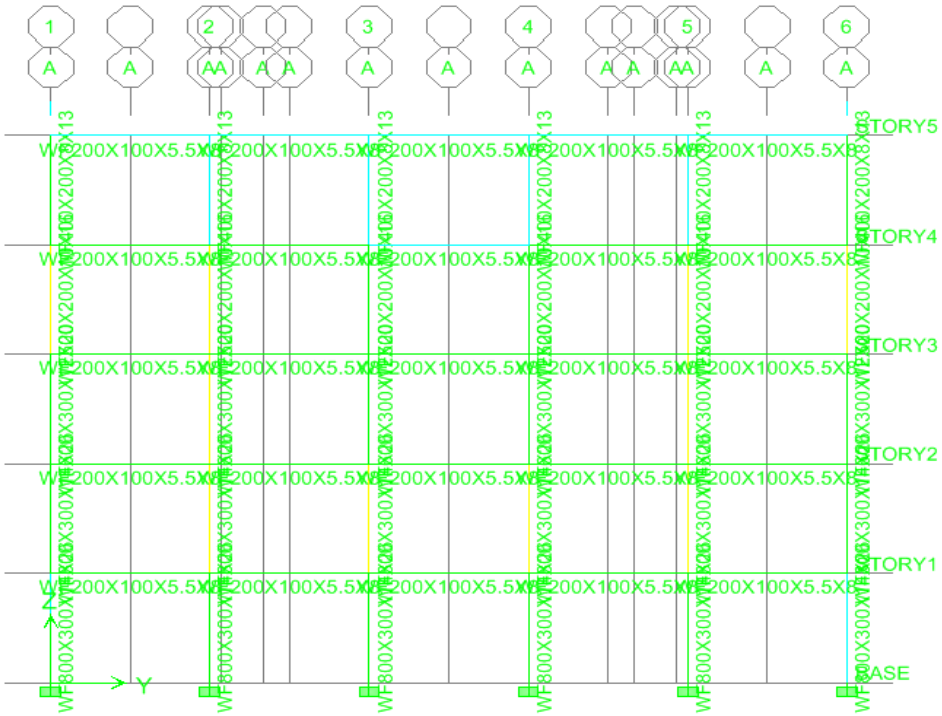
- Gaya geser

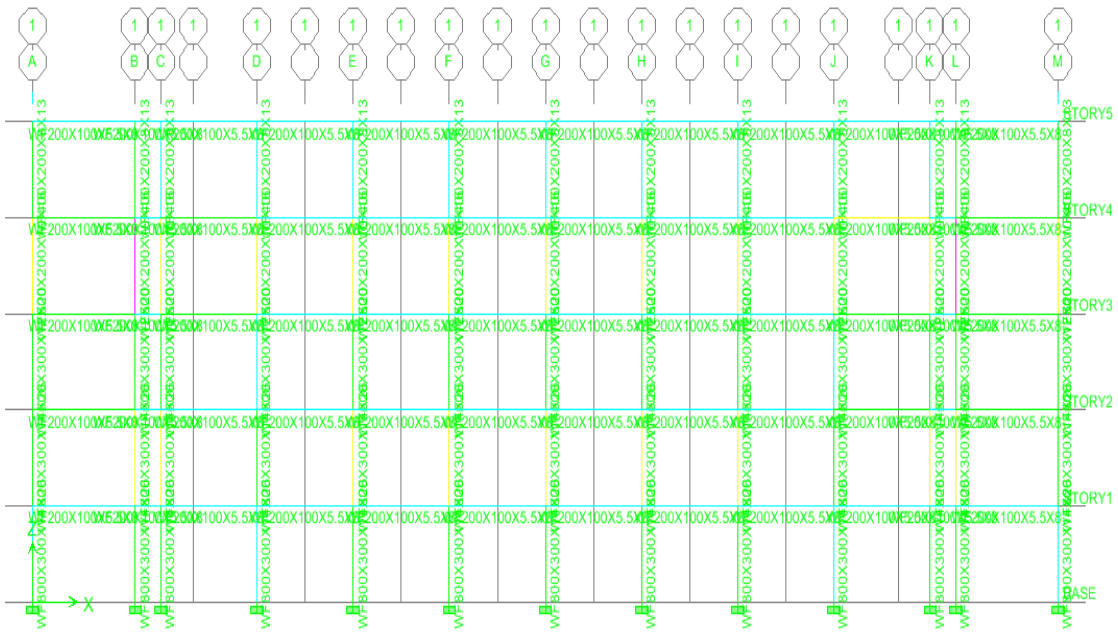


- Gaya momen

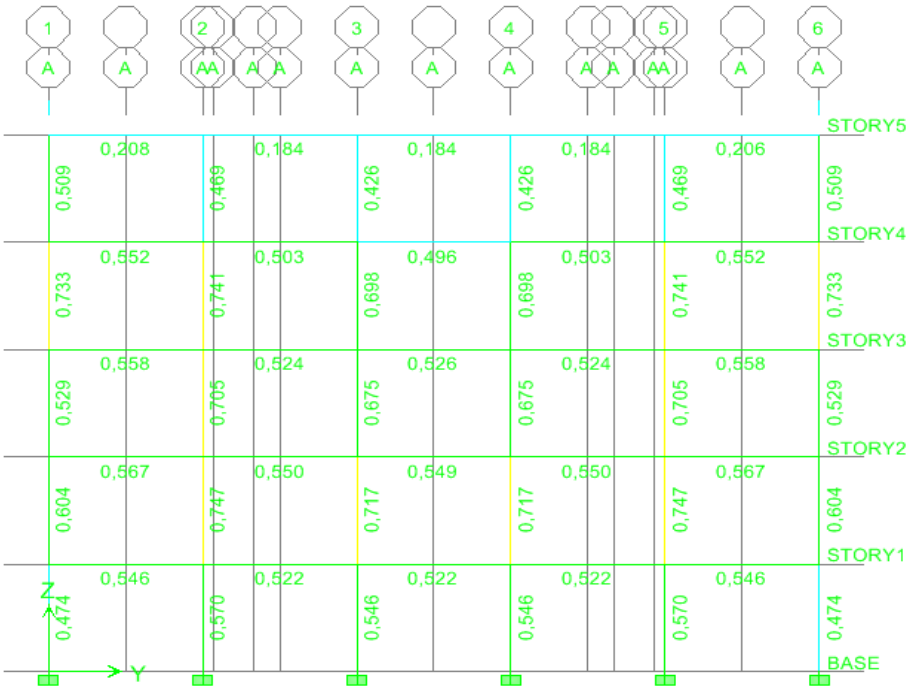


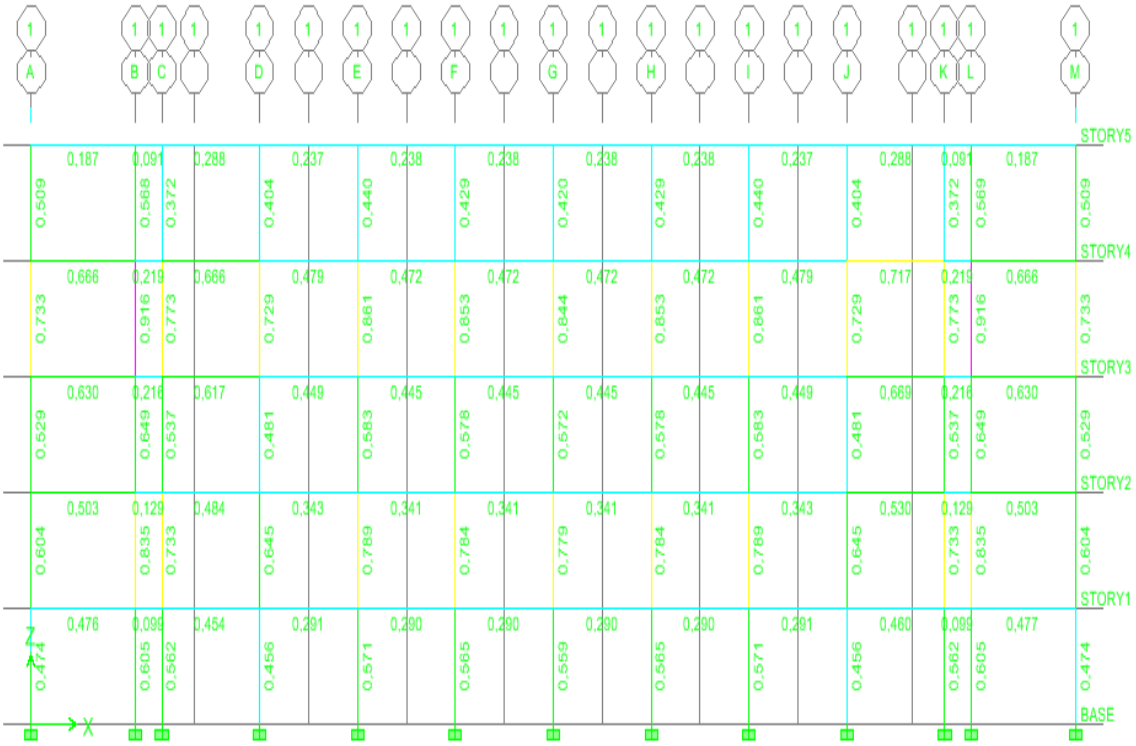
- *Design/ cek structure*



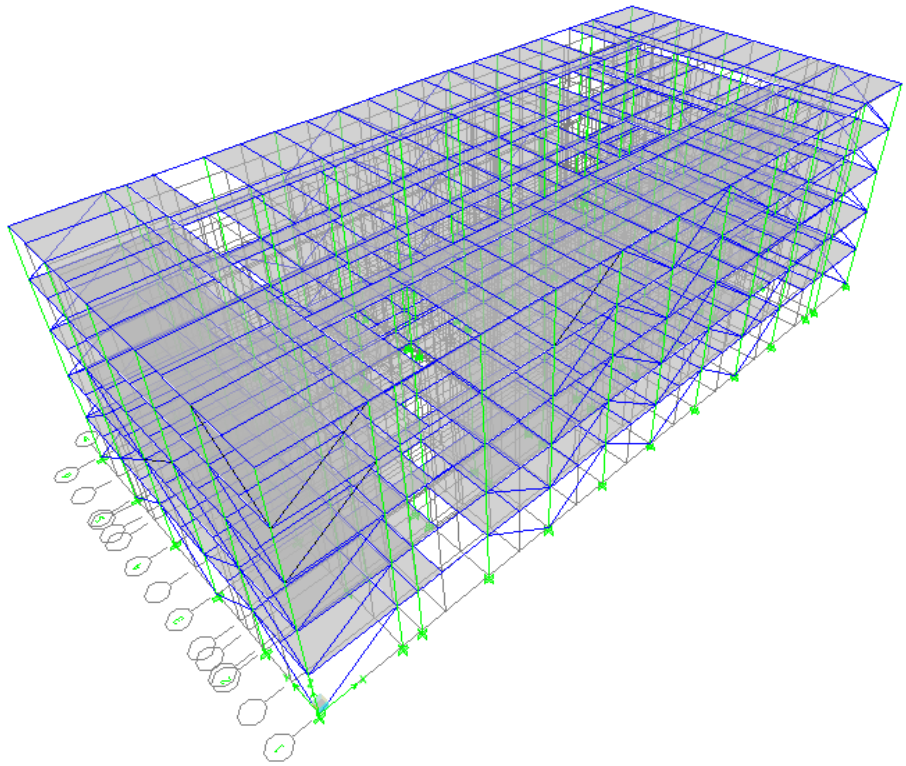


- PM-Ratio

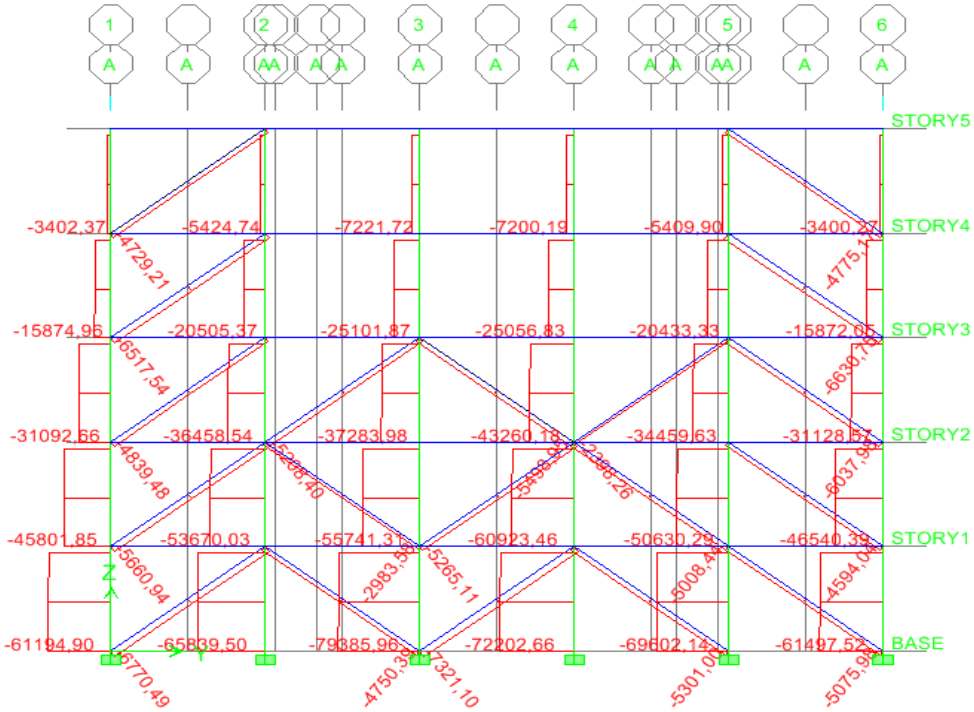

1
2
3
4
5
6
A
AA
STORY5
STORY4
STORY3
STORY2
STORY1
BASE
0,208
0,184
0,184
0,184
0,206
0,552
0,503
0,496
0,503
0,552
0,558
0,524
0,526
0,524
0,558
0,567
0,550
0,549
0,550
0,567
0,546
0,522
0,522
0,522
0,546
0,509
0,469
0,426
0,426
0,469
0,509
0,733
0,741
0,698
0,698
0,741
0,733
0,529
0,705
0,675
0,675
0,705
0,529
0,604
0,747
0,717
0,717
0,747
0,604
0,474
0,570
0,546
0,546
0,570
0,474
Z
Y


1
A
B
C
D
E
F
G
H
I
J
K
L
M
STORY5
STORY4
STORY3
STORY2
STORY1
BASE
0,187
0,091
0,288
0,237
0,238
0,238
0,238
0,238
0,237
0,288
0,091
0,187
0,666
0,219
0,666
0,479
0,472
0,472
0,472
0,472
0,479
0,717
0,219
0,666
0,630
0,216
0,617
0,449
0,445
0,445
0,445
0,445
0,449
0,669
0,216
0,630
0,503
0,129
0,484
0,343
0,341
0,341
0,341
0,341
0,343
0,530
0,129
0,503
0,476
0,099
0,454
0,291
0,290
0,290
0,290
0,290
0,291
0,460
0,099
0,477
0,509
0,568
0,372
0,404
0,440
0,429
0,420
0,429
0,440
0,404
0,372
0,569
0,509
0,733
0,916
0,773
0,729
0,861
0,853
0,844
0,853
0,861
0,729
0,773
0,916
0,733
0,529
0,649
0,537
0,481
0,583
0,578
0,572
0,578
0,583
0,481
0,537
0,649
0,529
0,604
0,835
0,733
0,645
0,789
0,784
0,779
0,784
0,789
0,645
0,733
0,835
0,604
0,474
0,605
0,562
0,456
0,571
0,565
0,559
0,565
0,571
0,456
0,562
0,605
0,474
Z
X

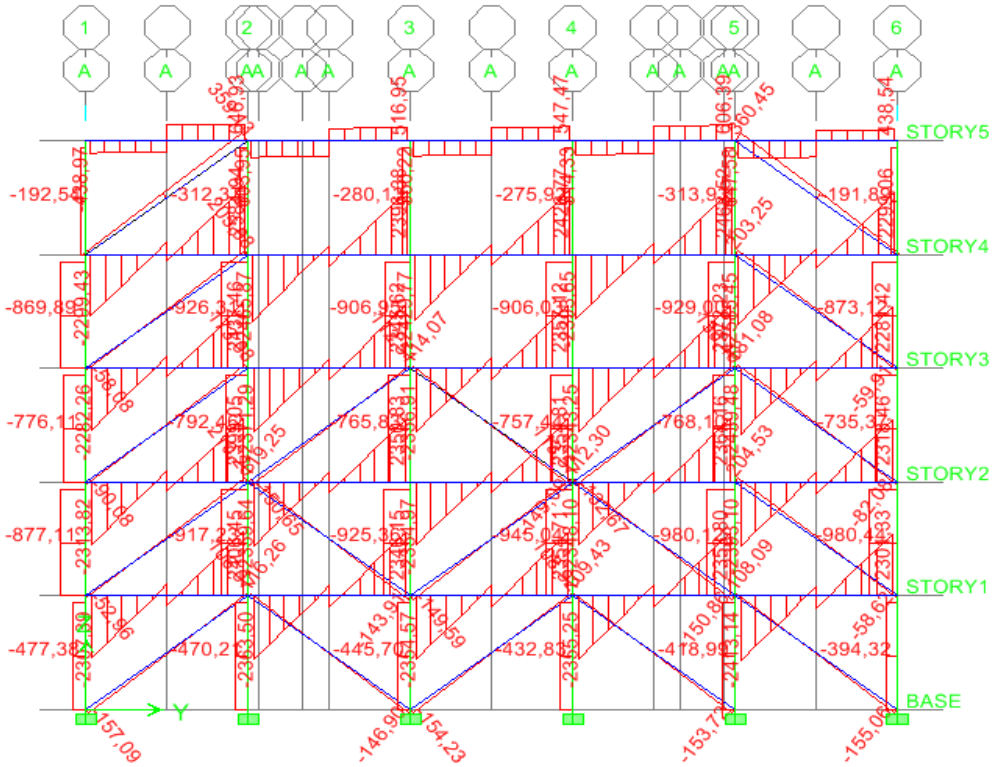
2. Gedung B



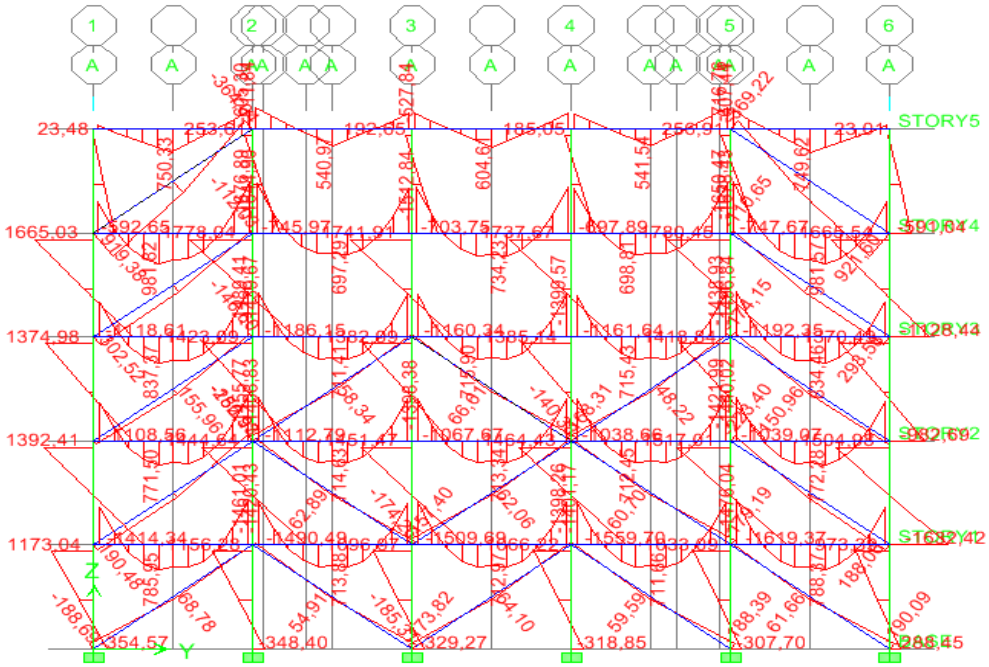
- Gaya aksial



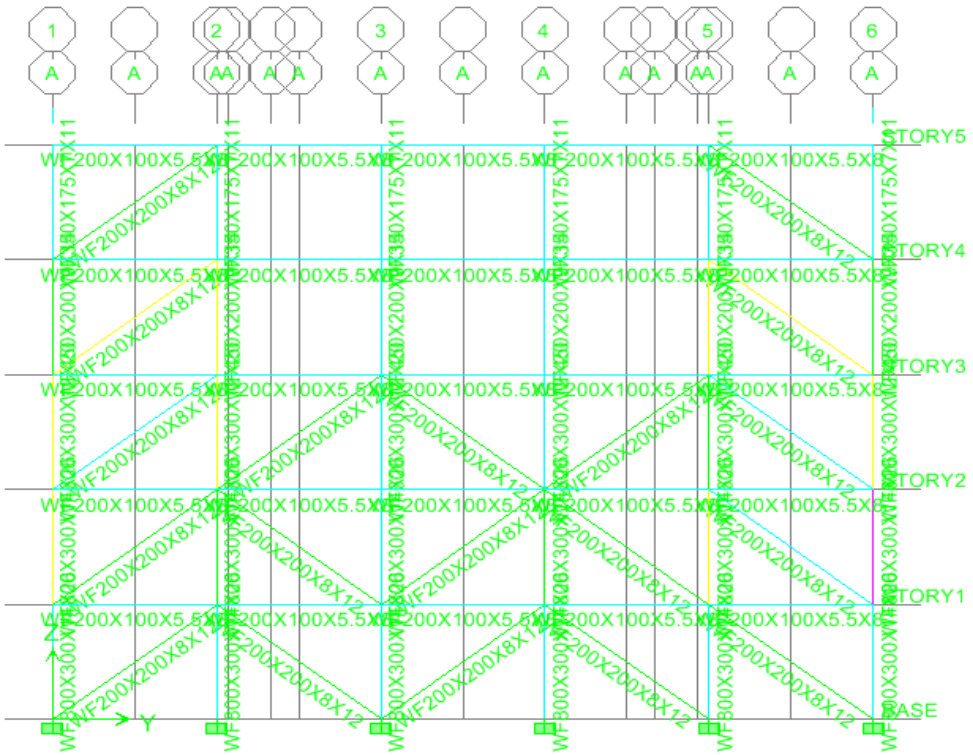
- Gaya geser

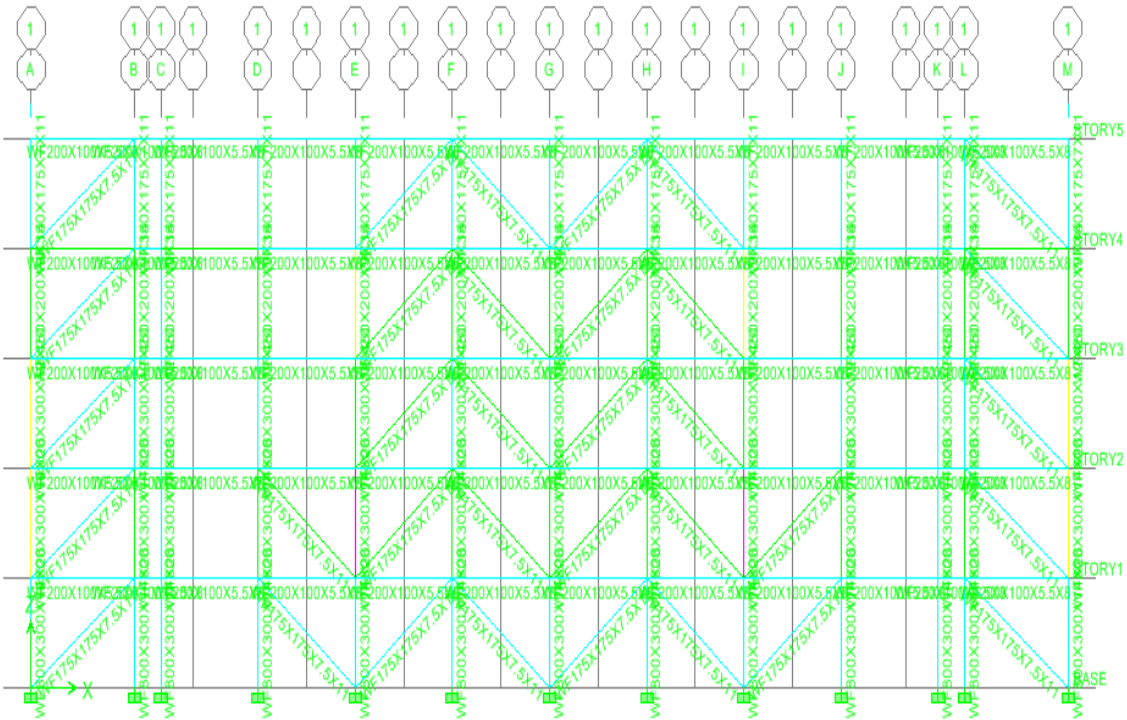


- Gaya momen

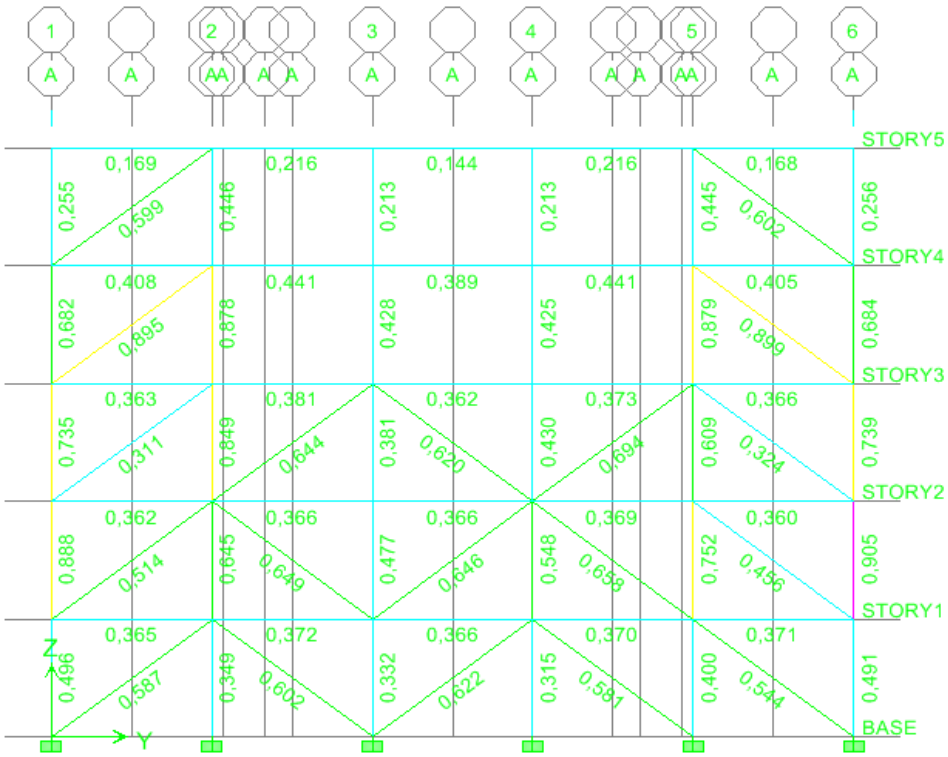


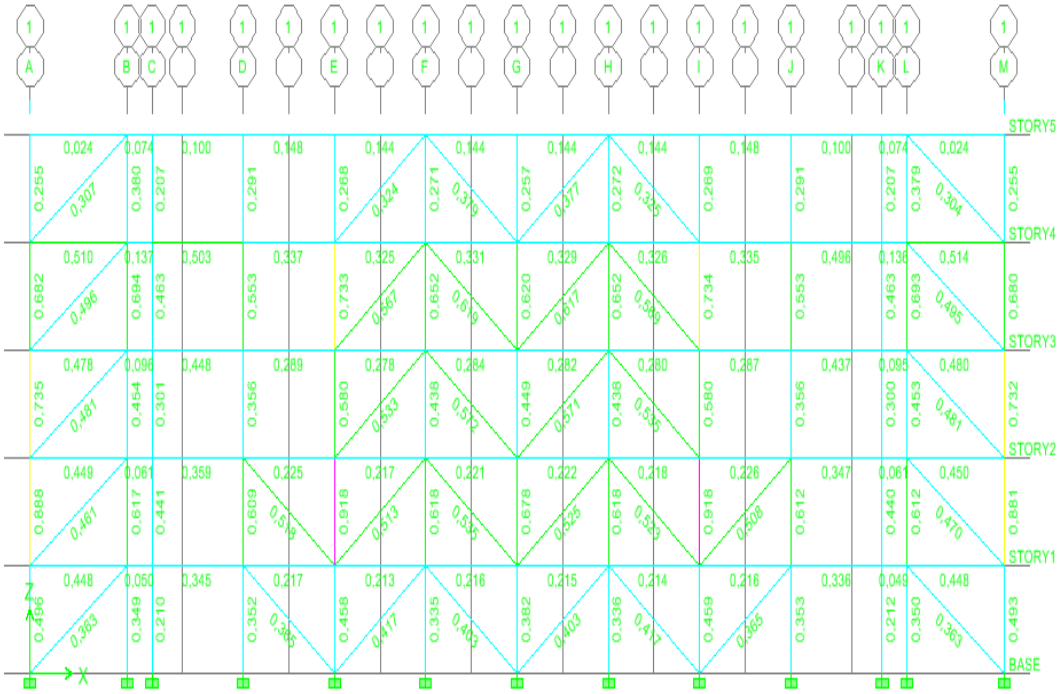
- *Design/cek structure*





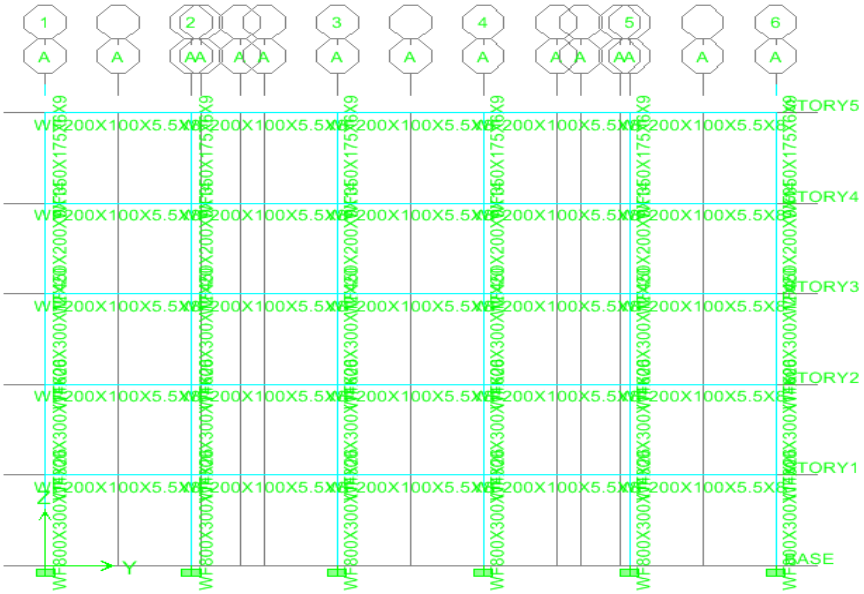
- PM-Ratio

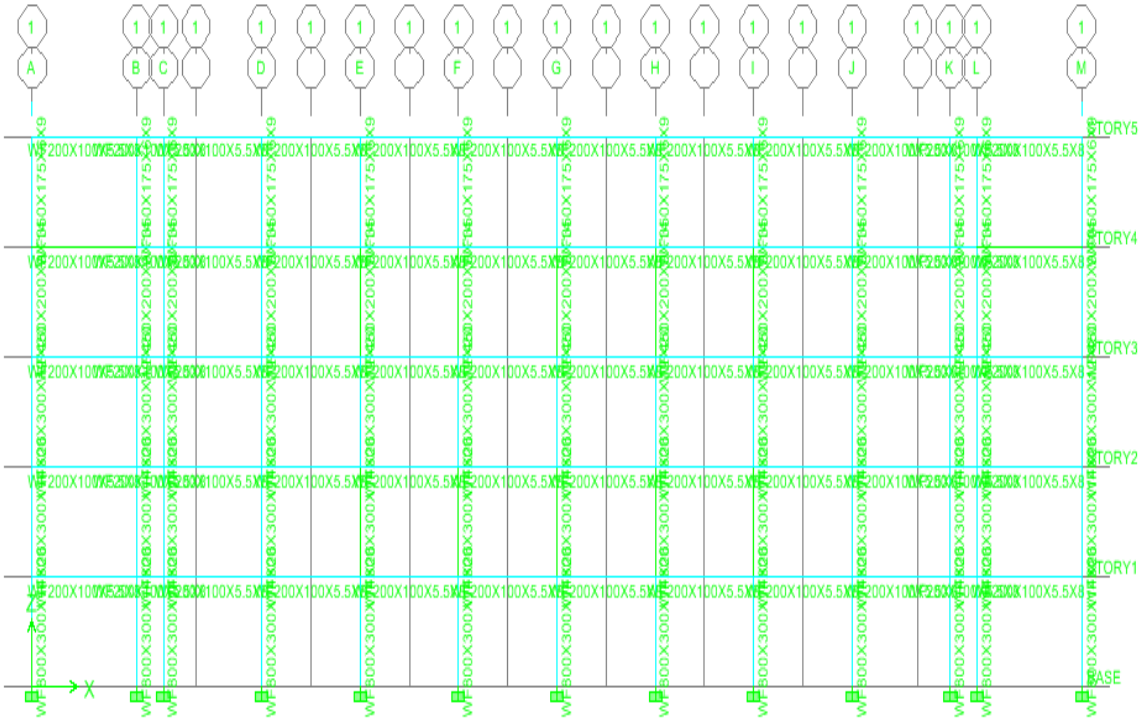

1
2
3
4
5
6
A
AA
STORY5
STORY4
STORY3
STORY2
STORY1
BASE
Z
Y


A
B
C
D
E
F
G
H
I
J
K
L
M
STORY5
STORY4
STORY3
STORY2
STORY1
BASE
Z
X

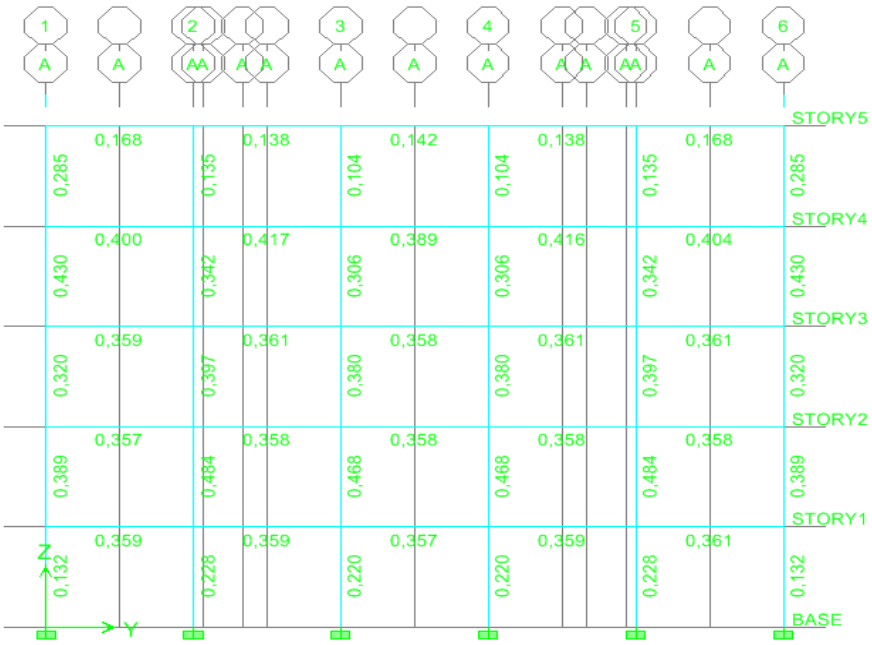
Beban lateral 25 %

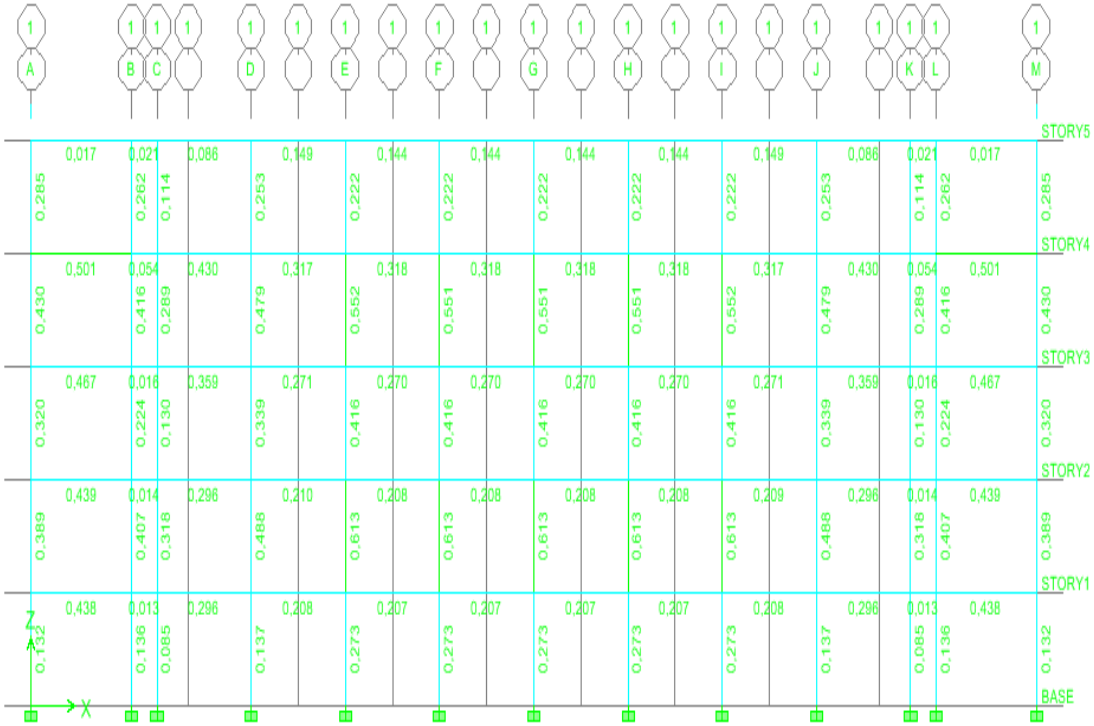
- *Design/cek structure*





- PM-Ratio


1 2 3 4 5 6
A AA
STORY5
STORY4
STORY3
STORY2
STORY1
BASE
0,168 0,138 0,142 0,138 0,168
0,400 0,417 0,389 0,416 0,404
0,359 0,361 0,358 0,361 0,361
0,357 0,358 0,358 0,358 0,358
0,359 0,359 0,357 0,359 0,361
0,285 0,135 0,104 0,104 0,135 0,285
0,430 0,342 0,306 0,306 0,342 0,430
0,320 0,397 0,380 0,380 0,397 0,320
0,389 0,484 0,468 0,468 0,484 0,389
0,132 0,228 0,220 0,220 0,228 0,132
Z
Y


1 A B C D E F G H I J K L M
STORY5
STORY4
STORY3
STORY2
STORY1
BASE
0,017 0,021 0,086 0,149 0,144 0,144 0,144 0,144 0,149 0,086 0,021 0,017
0,501 0,054 0,430 0,317 0,318 0,318 0,318 0,318 0,317 0,430 0,054 0,501
0,467 0,016 0,359 0,271 0,270 0,270 0,270 0,270 0,271 0,359 0,016 0,467
0,439 0,014 0,296 0,210 0,208 0,208 0,208 0,208 0,209 0,296 0,014 0,439
0,438 0,013 0,296 0,208 0,207 0,207 0,207 0,207 0,208 0,296 0,013 0,438
0.285 0.262 0.114 0.253 0.222 0.222 0.222 0.222 0.222 0.253 0.114 0.262 0.285
0.430 0.416 0.289 0.479 0.552 0.551 0.551 0.551 0.552 0.479 0.289 0.416 0.430
0.320 0.224 0.130 0.339 0.416 0.416 0.416 0.416 0.416 0.339 0.130 0.224 0.320
0.389 0.407 0.318 0.488 0.613 0.613 0.613 0.613 0.613 0.488 0.318 0.407 0.389
0.132 0.136 0.085 0.137 0.273 0.273 0.273 0.273 0.273 0.137 0.085 0.136 0.132
Z
X

L2.2 Hasil analisis metode statik ekivalen

Metode statik ekivalen

Gedung A

Tabel L2.1 *Modal participating mass ratio*

Mode	Period	UX	UY	UZ	SumUX	SumUY	Sum UZ	RX	RY	RZ	SumRX	SumRY	SumRZ
1	0,933957	0	71,1267	0	0	71,1267	0	98,3766	0	0	98,3766	0,0001	0,0009
2	0,768774	0	0	0	0	71,1267	0	0	0	69,4518	98,3766	99,1991	0,2291
3	0,505362	68,0498	0	0	68,0498	71,1267	0	0	97,6282	0	98,3766	99,5263	74,8201
4	0,373239	0	17,5188	0	68,0498	88,6455	0	1,3438	0	0	99,7205	99,5263	74,8211
5	0,269879	0	0	0	68,0498	88,6455	0	0	0	15,6044	99,7205	99,527	92,6976
6	0,227798	0	4,059	0	68,0498	92,7045	0	0,2396	0	0	99,96	99,527	92,7395
7	0,15738	15,6174	0	0	83,6672	92,7045	0	0	1,5332	0	99,96	99,6293	92,7413
8	0,144547	0	5,2441	0	83,6672	97,9486	0	0,01	0	0	99,9701	99,6293	92,7415
9	0,142383	0	0	0	83,6672	97,9486	0	0	0	6,2576	99,9701	99,6505	95,5665
10	0,088422	0	2,0514	0	83,6672	100	0	0,0299	0	0	100	99,9149	95,6787
11	0,084083	0	0	0	83,6672	100	0	0	0	5,3117	100	99,9149	95,6788
12	0,077465	7,3139	0	0	90,981	100	0	0	0,5883	0	100	99,9159	98,7341

Tabel L2.2 *Center mass rigidty*

story	diaphragm	MassX	MassY	XCM	YCM	CumMassX	CumMassY	XCCM	YCCM	XCR	YCR
5	D1	22882,331	22882,331	24	11,25	22882,331	22882,331	24	11,25	24	11,25
4	D1	26014,8061	26014,8061	24	11,25	48897,1372	48897,1372	24	11,25	24	11,25
3	D1	27219,3068	27219,3068	24	11,25	76116,4439	76116,4439	24	11,25	24	11,25
2	D1	28780,4652	28780,4652	24	11,25	104896,909	104896,909	24	11,25	24	11,25
1	D1	29576,1152	29576,1152	24	11,25	134473,024	134473,024	24	11,25	24	11,25

Tabel L2.3 Nilai Gaya Geser Nominal Statik Ekivalen (V_{1y}) arah-y

T_y Etabs = 0,505362 detik

Story	Berat struktur (kg)	C	I	R	V_{1y}
5	224475,6671	0,296816935	1	4,5	87012,23864
4	255205,2478				
3	267021,3997				
2	282336,3636				
1	290141,6901				
Wt	1319180,368				

$$V_{1y} = \frac{C_1 \cdot I}{R} \cdot W_t$$

$$= \frac{(0{,}296816935) \cdot 1}{4{,}5} \cdot 1319180{,}368$$

= 87012,23864 kg

Tabel L2.4 Nilai Gaya Geser Nominal Statik Ekivalen (V_{1x}) arah-x

T_x Etabs = 0,373239 detik

Story	Berat struktur (kg)	C	I	R	V_{1y}
5	224475,6671	0,401887263	1	4,5	117813,7305
4	255205,2478				
3	267021,3997				
2	282336,3636				
1	290141,6901				
Wt	1319180,368				

$$V_{1y} = \frac{C_1 \cdot I}{R} \cdot W_t$$

$$= \frac{(0{,}401887263) \cdot 1}{4{,}5} \cdot 1319180{,}368$$

= 117813,7305 kg

Gedung B

Tabel L2.5 *Mass participating factor ratio*

Mode	Period	UX	UY	UZ	SumUX	SumUY	Sum UZ	RX	RY	RZ	SumRX	SumRY	SumRZ
1	0,350249	0	68,4096	0	0	68,4096	0	96,8197	0	0,0001	96,8197	0,0001	0,0009
2	0,243049	75,3702	0	0	75,3702	68,4096	0	0	99,4375	0,0002	96,8197	99,1991	0,2291
3	0,209554	0,0001	0,0001	0	75,3703	68,4097	0	0,0002	0,0002	74,5368	96,8198	99,5263	74,8201
4	0,150255	0	24,2752	0	75,3703	92,6849	0	3,0619	0	0	99,8818	99,5263	74,8211
5	0,087591	0,0033	0,0002	0	75,3736	92,6851	0	0	0,0001	18,0325	99,8818	99,527	92,6976
6	0,085356	0,0001	2,8465	0	75,3737	95,5315	0	0,0287	0	0,0003	99,9105	99,527	92,7395
7	0,084706	13,4563	0	0	88,83	95,5315	0	0	0,1227	0,0035	99,9105	99,6293	92,7413
8	0,06156	0	3,5983	0	88,83	99,1298	0	0,0716	0	0	99,9821	99,6293	92,7415
9	0,050031	0,0001	0,0002	0	88,8302	99,1301	0	0	0	3,0563	99,9821	99,6505	95,5665
10	0,049498	4,8051	0	0	93,6353	99,1301	0	0	0,3486	0,0001	99,9821	99,9149	95,6787
11	0,043828	0	0,8699	0	93,6353	99,9999	0	0,0179	0	0,0006	100	99,9149	95,6788
12	0,037909	0	0,0001	0	93,6353	100	0	0	0	3,0568	100	99,9159	98,7341

Tabel L2.6 *Center mass rigidty*

story	diaphragm	MassX	MassY	XCM	YCM	CumMassX	CumMassY	XCCM	YCCM	XCR	YCR
5	D1	22994,93	22994,93	24	11,25	22994,93	22994,93	24	11,25	23,966	11,25
4	D1	26139,89	26139,89	24	11,25	49134,82	49134,82	24	11,25	23,957	11,246
3	D1	27497,57	27497,57	23,988	11,249	76632,39	76632,39	23,996	11,25	23,935	11,241
2	D1	29379,31	29379,31	24	11,246	106011,7	106011,7	23,997	11,248	24,022	11,238
1	D1	30206,66	30206,66	24,011	11,247	136218,4	136218,4	24	11,248	23,971	11,247

Tabel L2.7 Nilai Gaya Geser Nominal Statik Ekivalen (V_{1y}) arah-y

T_y Etabs = 0,209554 detik

Story	Berat struktur (kg)	C	I	R	V_{1y}
5	225580,2221	0,715806	1	4,2	227745,9583
4	256432,3415				
3	269751,2019				
2	288211,0458				
1	296327,3317				
Wt	1336302,143				

$$V_{1y} = \frac{C_1 \cdot I}{R} \cdot W_t$$

$$= \frac{(0,715806) \cdot 1}{4,2} \cdot 1336302,143$$

$$= 227745,9583 \text{ kg}$$

Tabel L2.8 Nilai Gaya Geser Nominal Statik Ekivalen (V_{1x}) arah-x

T_x Etabs = 0,150255 detik

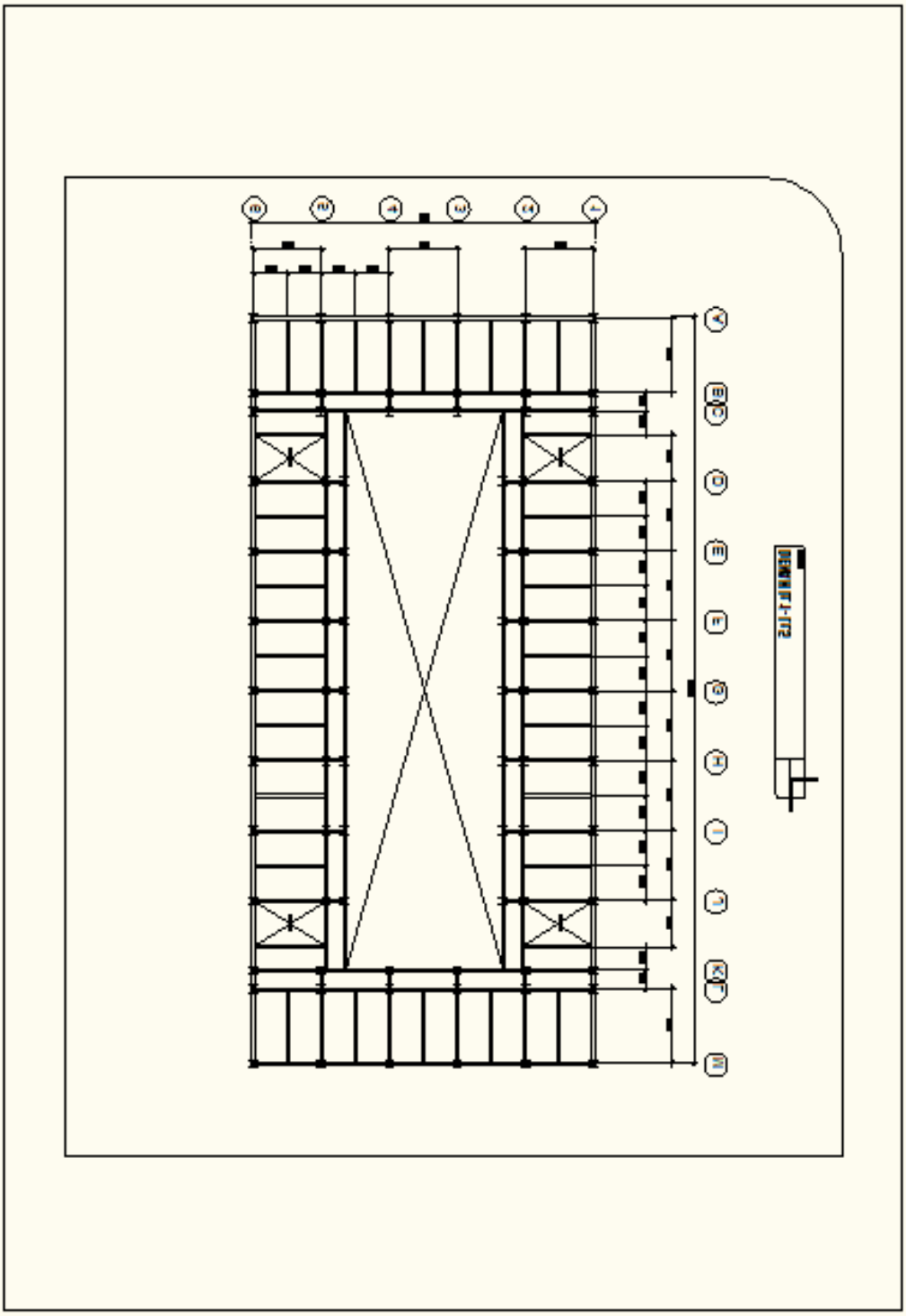
Story	Berat struktur (kg)	C	I	R	V_{1y}
5	225580,2221	0,998303	1	4,2	317627,2106
4	256432,3415				
3	269751,2019				
2	288211,0458				
1	296327,3317				
Wt	1336302,143				

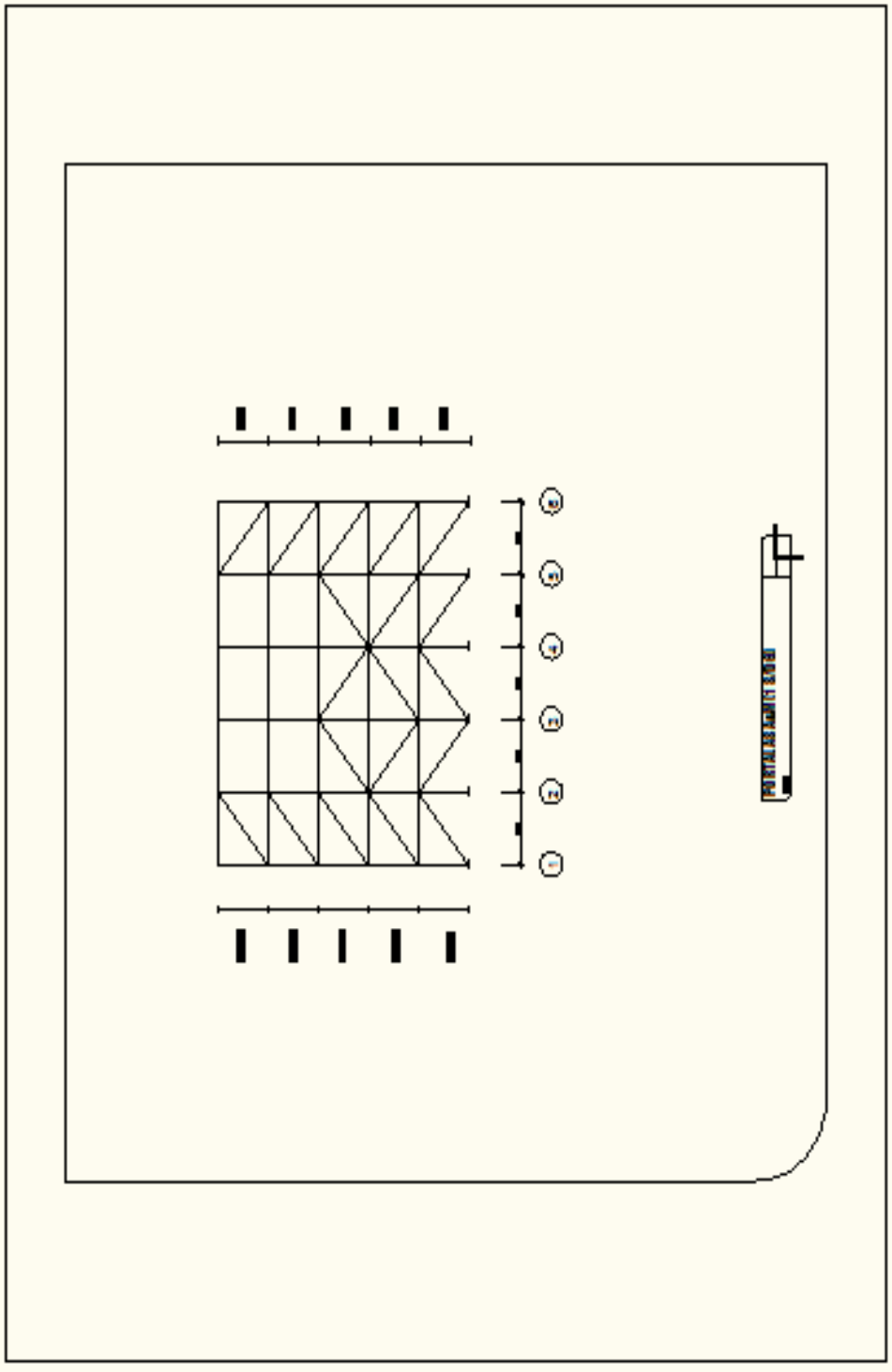
$$V_{1y} = \frac{C_1 \cdot I}{R} \cdot W_t$$

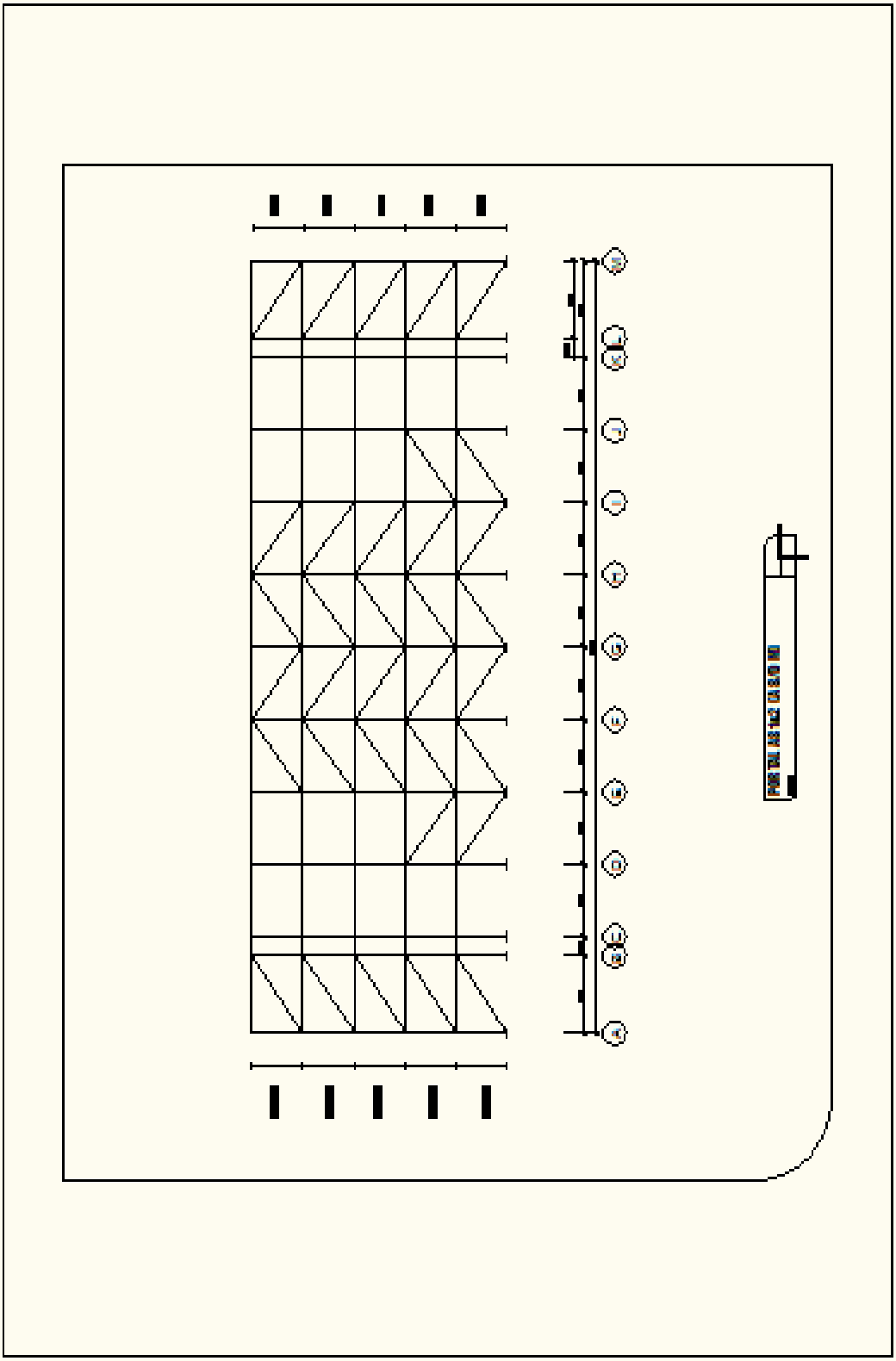
$$= \frac{(0{,}998303) \cdot 1}{4{,}2} \cdot 1336302{,}143$$

$$= 317627{,}2106 \text{ kg}$$

LAMPIRAN 3 GAMBAR ARSITEKTUR, GAMBAR STRUKTUR, BROSUR, DAN LAIN-LAIN



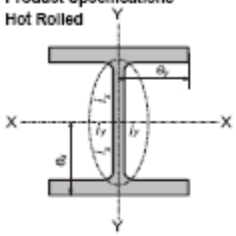




P.T. GUNUNG GARUDA
Steel Is Our Business

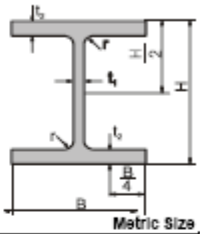
Wide Flange Shape

Product Specifications
Hot Rolled



Geometrical moment of inertia $I = Ai^2$
Radius of gyration of area $I = \sqrt{I/A}$
Modulus of section $z = I/e$

(A = sectional area)



According JIS G 3192

Metric Size

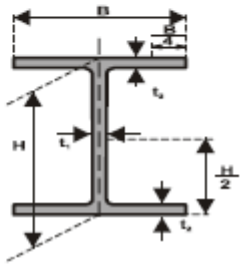
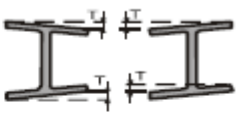
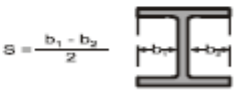
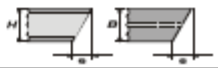
Standard Sectional Dimension					Section Area	Unit Weight	Informative Reference					
							Geometrical Moment Of Inertia		Radius Of Gyration Of Area		Modulus Of Section	
Nominal Dimensional mm	H x B mm	t1 mm	t2 mm	r mm	A cm²	kg/m	Ix cm⁴	Iy cm⁴	ix cm	iy cm	Zx cm³	Zy cm³
100 x 100	100 x100	6	8	10	21.90	17.20	383	134	4.18	2.47	76.50	26.7
125 x125	125 x125	6.5	9	10	30.31	23.80	847	293	5.29	3.11	136.00	47.00
150 x 75	150 x75	5	7	8	17.85	14.00	666	50	6.11	1.66	8.88	13.20
150 x 100	150 x100	6	9	11	26.84	21.10	1,020	151	6.17	2.37	138.00	30.10
150 x 150	150 x150	7	10	11	40.14	31.50	1,640	563	6.39	3.75	219.00	75.10
175 x 175	175 x175	7.5	11	12	51.21	40.20	2,880	984	7.50	4.38	330.00	112.00
200 x 100	198 x 99	4.5	7	11	23.18	18.20	1,580	114	8.26	2.21	160.00	23.00
	200 x 100	5.5	8	11	27.16	21.30	1,840	134	8.24	2.22	184.00	26.80
200 x 150	194 x 150	6	9	12	38.80	30.60	2,675	507	8.30	3.60	275.80	67.60
200 x 200	200 x 200	8	12	13	63.53	49.90	4,720	1,600	8.62	5.02	472.00	160.00
250 x 125	248 x 124	5	8	12	32.68	25.70	3,540	255	10.40	2.79	285.00	41.10
	250 x 125	6	9	12	37.66	29.60	4,050	294	10.40	2.79	324.00	47.00
250 x 250	250 x 250	9	14	16	92.18	72.40	10,800	3,650	10.80	6.29	867.00	292.00
300 x 150	298 x 149	5.5	8	13	40.80	32.00	6,320	442	12.40	3.29	424.00	59.30
	300 x 150	6.5	9	13	46.78	36.70	7,210	508	12.40	3.29	481.00	67.70
300 x 300	300 x 300	10	15	18	119.80	94.00	20,400	6,750	13.10	7.51	1,360.00	450.00
350 x 175	346 x 174	6	9	14	52.68	41.40	11,100	792	14.50	3.88	641.00	91.00
	350 x 175	7	11	14	63.14	49.60	13,600	984	14.70	3.95	775.00	112.00
350 x 350	350 x 350	12	19	20	173.9	137.00	40,300	13,600	15.20	8.84	2,300.00	776.00
400 x 200	396 x 199	7	11	16	72.16	56.60	20,000	1,450	16.70	4.48	1,010.00	145.00
	400 x 200	8	13	16	84.1	66.00	23,700	1,740	16.80	4.54	1,190.00	174.00
400 x 400	400 x 400	13	21	22	218.7	172.00	66,600	22,400	17.50	10.10	3,330.00	1120.00
450 x 200	450 x 200	9	14	18	96.8	76.00	33,500	1,870	18.60	4.40	1,490.00	187.00
500 x 200	500 x 200	10	16	20	114.2	89.60	47,800	2,140	20.50	4.33	1,910.00	214.00
600 x 200	600 x 200	11	17	22	134.4	106.00	77,600	2,280	24.00	4.12	2,590.00	228.00
600 x 200	588 x 300	12	20	28	192.5	151.00	118,000	9,020	24.80	6.85	4,020.00	601.00
700 x 300	700 x 300	13	24	28	235.5	185.00	201,000	10,800	29.30	6.78	5,760.00	722.00
800 x 300	800 x 300	14	26	28	267.4	210.00	292,000	11,700	33.00	6.62	7,290.00	782.00
900 x 300	900 x 300	16	28	28	309.8	243.00	411,000	12,600	36.40	6.39	9,140.00	843.00

P.T. GUNUNG GARUDA
Steel To Our Business

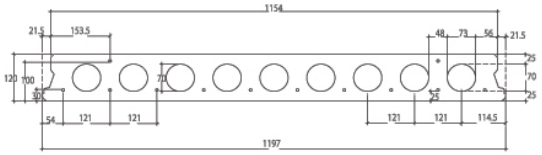
Wide Flange Shape

Dimensional Tolerances

According JIS G 3192

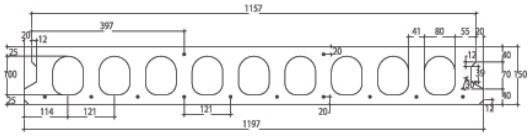
Item, mm (in.)			Tolerance	Remarks
Width (*B*)			± 3.0 (0.118)	
Depth (*H*)		Nominal depth of under 400 (15.748)	± 3.0 (0.118)	
		400 to 600 (23.622), excl.	± 4.0 (0.157)	
		600 and over	± 5.0 (0.197)	
Thickness	Flange t^2	Under 16	± 1.5 (0.059)	
		16 or over to and excl. 25	± 2.0 (0.079)	
		25 or over to and excl. 40	± 2.5 (0.098)	
		40 or over	± 3.0 (0.118)	
	Web t^1	Under 16	± 1.0 (0.039)	
		16 or over to and excl. 25	± 1.5 (0.024)	
		25 or over to and excl. 40	± 2.0 (0.079)	
		40 or over	± 2.5 (0.098)	
Length		7 m or under	+ 40 (1.575)	
			- 0	
		Over 7 m	40 (1.575) plus 5 (0.197) for each additional meter or fraction there of	
Out-of-Square (T)		Nominal depths 300 (11.811) or under in nominal depth	Not more than 1.2 percent of flange width B or 2.0 (0.079) at minimum.	
		Nominal depths Over 300 (11.811) in nominal depth	Not more than 1.5 percent of flange width B or 2.0 (0.079) at minimum.	
Chamber of Sweep		Nominal depths 300 (11.811) and under	Not more than 0.20 percent of Length.	Horizontal or Vertical Curvature in the direction of length
		Nominal depths Over 300 (11.811)	Not more than 0.10 percent of Length.	
Web Off Centre (S)		Nominal depths 300 (11.811) and under	± 3.0 (0.118)	
		Nominal depths Over 300 (11.811)	± 4.5 (0.117)	
Ends Out of Square (e)			1.6% or under of width B or of depth H, provided that 3.0mm is the minimum	

Hollow Core Slab - Details



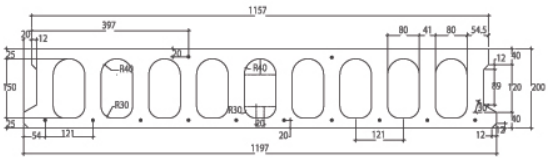
Type	Area (cm2)	Self Load	Rongga
HCS 120	990.88	206.42	26%

Cross section HCS 120 MM



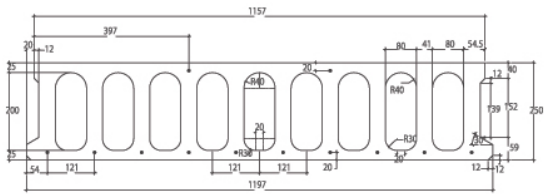
Type	Area (cm2)	Self Load	Rongga
HCS 150	1117.18	223	35.80%

Cross section HCS 150 MM



Type	Area (cm2)	Self Load	Rongga
HCS 200	1323.68	265	42.60%

Cross section HCS 200 MM



Type	Area (cm2)	Self Load	Rongga
HCS 250	1530.18	206	46.70%

Cross section HCS 250 MM

Hollow Core Slab - Load Capacity Table

LOAD CAPACITY OF HCS (Kg/m2)
Without Topping

TIPE (t.d.n)	DAYA DUKUNG MAXIMAL (Kg/m2) (Netto, setelah dikurangi berat sendiri)																
Bentang (m)	4,00	4,25	4,50	4,75	5,00	5,25	5,50	5,75	6,00	6,25	6,50	6,75	7,00	7,25	7,50	7,75	8,00
120.05.12	590,00	500,00	420,00	355,00	300,00	250,00											
120.05.14	690,00	585,00	500,00	425,00	360,00	310,00	260,00										
120.05.16	790,00	675,00	575,00	495,00	425,00	365,00	315,00	270,00									
150.05.12	905,00	775,00	665,00	570,00	490,00	425,00	365,00	310,00	265,00								
150.05.14	1.040,00	895,00	770,00	670,00	580,00	500,00	435,00	375,00	325,00	280,00							
150.05.16	1.180,00	1.015,00	880,00	765,00	665,00	580,00	510,00	445,00	385,00	340,00	295,00						
150.07.12	1.530,00	1.330,00	1.160,00	1.015,00	890,00	785,00	695,00	615,00	545,00	480,00	425,00	380,00	335,00	295,00			
150.07.14	1.800,00	1.565,00	1.370,00	1.205,00	1.060,00	940,00	835,00	731,66	643,96	569,74	506,49	452,28	405,53	365,01			
200.05.12	1.470,00	1.270,00	1.100,00	960,00	840,00	735,00	645,00	565,00	495,00	435,00	380,00	330,00	285,00				
200.05.14	1.670,00	1.445,00	1.255,00	1.100,00	965,00	850,00	745,00	660,00	580,00	515,00	455,00	400,00	350,00	310,00			
200.05.16	1.865,00	1.620,00	1.415,00	1.240,00	1.090,00	960,00	850,00	755,00	670,00	595,00	530,00	470,00	415,00	370,00	325,00	285,00	
200.07.12	2.370,00	2.065,00	1.810,00	1.595,00	1.415,00	1.255,00	1.120,00	1.000,00	895,00	800,00	720,00	645,00	580,00	520,00	470,00	420,00	375,00
200.07.14	2.755,00	2.410,00	2.120,00	1.870,00	1.660,00	1.480,00	1.325,00	1.185,00	1.065,00	960,00	865,00	780,00	705,00	640,00	580,00	525,00	475,00
200.07.16	3.145,00	2.750,00	2.425,00	2.145,00	1.910,00	1.705,00	1.525,00	1.375,00	1.235,00	1.120,00	1.010,00	915,00	835,00	755,00	690,00	625,00	570,00

t = tebal pelat (mm) ; d = diammeter PC-WIRE (mm) ; n = jumlah PC-WIRE

Technical Specification :

- Plank Thickness : 120, 150, 200, 250 mm
- Plank Width : 1200 mm
- Weight : 198, 223, 265, 306 kg/m2
- Plank length : can be customized
- Reinforcement : PC-Wire Ø5 and Ø7 mm
- Concrete Quality : K - 450
- Surface : expose

Advantages :

- **Tension process conducted accurately, to assure the requirements of pre-stress.**
- **Hollow-core floor plank** is 29-42% lighter from traditional concrete, thus increasing load capacity.
- **Plank deflection effect** of full load capacity is very small, caused by chamber created by the tension force.
- **Faster and easy installation**, can be done without propping structure.
- **Unfinished bottom surface** can be used as exposed concrete.
- **The "Pre-compression Effect"** on pre-stressed concrete gives pre-stressed concrete high temperature protection compared to traditional concrete.
- **The hollow cores decrease structural load.**