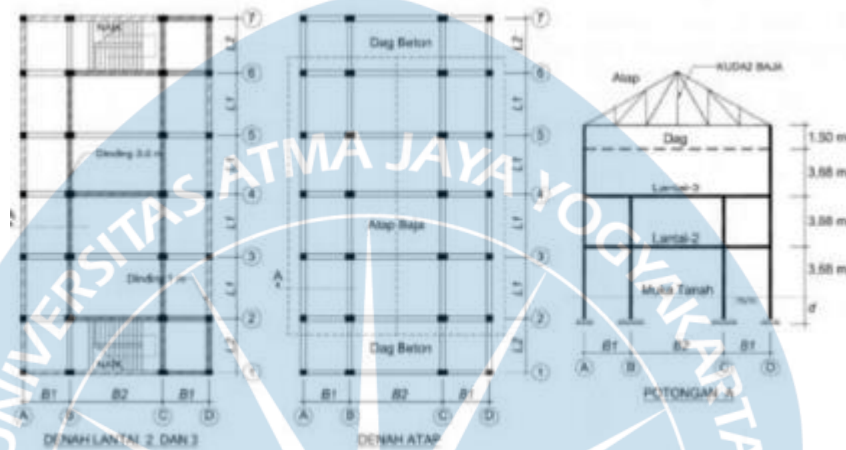


II. Praktik Perancangan Bangunan Gedung

2.1 Rencana Denah Bangunan

Berikut ini merupakan bangunan 3 lantai, material rangka bangunan terbuat dari struktur beton, sedangkan rangka atap dari struktur baja.



Gambar 1. Sketsa gedung tampak atas dan tampak samping

2.2 Perencanaan Atap

Sudut miring atap = 35°

Jenis atap = genteng beton

Jenis sambungan = Baut dengan $f = 290 \text{ Mpa}$

Tiupan angin = $0,40 \text{ kN/m}^2$

Beban Gording:

DL = $1,982 \text{ kN}$

LL = $1,0 \text{ kN}$

Profil C = $150 \times 50 \times 20 \times 3,2$

Cek Tegangan Profil C = $277,831 \text{ MPa} \leq 290 \text{ Mpa}$ (memenuhi syarat)

Cek Defleksi Gording = $9,074 \leq 15,625$ (memenuhi syarat)

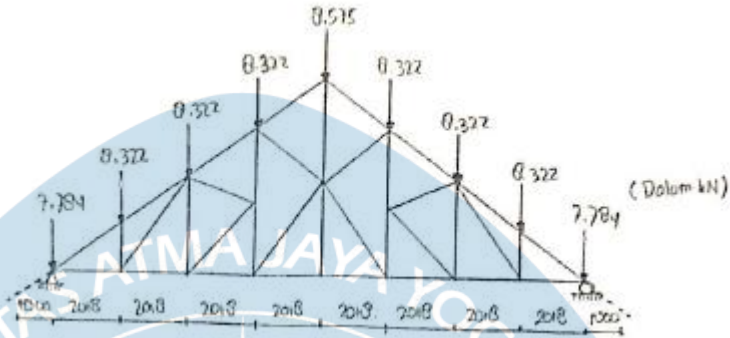
Luas Batang Sag-Rod yang diperlukan :

$A_{sr} = 53,274 \text{ mm}^2$

Baut yang dipilih :

$$D = 10 \text{ mm} \rightarrow A = 78,57 \text{ mm}^2 > 53,274 \text{ mm}^2 \text{ (memenuhi syarat)}$$

2.2.1 Rencana Beban Kuda-Kuda



Gambar 2. Bagian Rencana Kuda-Kuda

Beban $P_1 = 7,784 \text{ kN}$

Beban $P_2 = 8,322 \text{ kN}$

Beban $P_3 = 8,575 \text{ kN}$

Beban $W_1 = 1,472 \text{ kN}$

Beban $W_2 = 1,479 \text{ kN}$

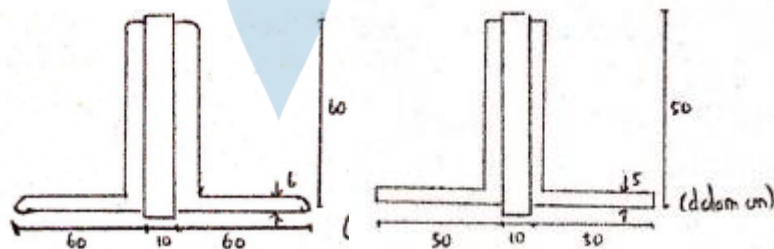
Beban $W_3 = 0,7398 \text{ kN}$

Beban $W_4 = 1,1097 \text{ kN}$

Beban $W_5 = 2,218 \text{ kN}$

Beban $W_6 = 2,2077 \text{ kN}$

2.2.2 Rencana Elemen Kuda-Kuda



Gambar 3. Sketsa Profil Bentang 60x60x6 dan 50x50x5

2.2.3 Rencana Sambungan Elemen Kuda-Kuda

Sambungan antar baut $V_d = 19000,35237 \text{ kN}$

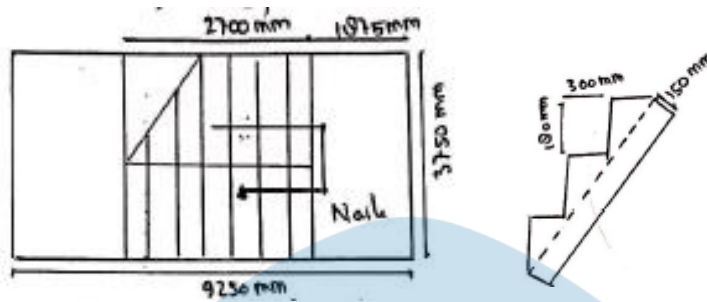
Kegagalan Tumpu $R_d = 62,64 \text{ kN}$

Jumlah baut dibutuhkan :

Profil 50, $n = 2$ baut

Profil 60, n = 3 baut

2.3 Perencanaan Tangga dan Plat Lantai



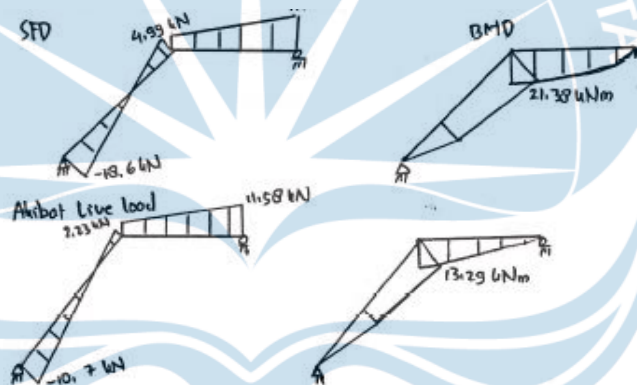
Gambar 4. Denah Ruang Tangga

2.3.1 Rencana Beban Tangga

Beban tangga $q_{tg} = 8,41 \text{ kN/m}^2$

Beban bordes $q_{bd} = 5,65 \text{ kN/m}^2$

Akibat Dead Load



Gambar 5. SFD dan BMD Tangga dari SAP2000

2.3.2 Rencana Penulangan Tangga

Rencana penulangan tangga tumpuan

$A_s = 524,56 \text{ mm}^2$

$A_{s \text{ perlu}} = 251,43 \text{ mm}^2$

$A_s > A_{s \text{ perlu}}$ (Aman)

Perencanaan penulangan tangga lapangan

$A_s = 863,76 \text{ mm}^2$

$S = 153,73$ maka digunakan d13-100

Perhitungan balok bordes

$LL = 22,74 \text{ kN/m}$

$$DL = 11,58 \text{ kN/m}$$

Rencana balok tumpuan

$$A_s = 629,79 \text{ mm}^2$$

$$N = 4,74 \rightarrow \text{Maka digunakan } 5d13$$

Rencana Tulangan lapanga

$$A_s = 379,75 \text{ mm}^2$$

$$N = 2,86 \rightarrow \text{Maka digunakan } 3d13$$

Rencana penulangan sengkang tumpuan

Misal digunakan 2p8

$$A_s = 100,57 \text{ mm}^2$$

$$S = 105,78 \text{ mm} \rightarrow \text{Maka digunakan } 2p8-100$$

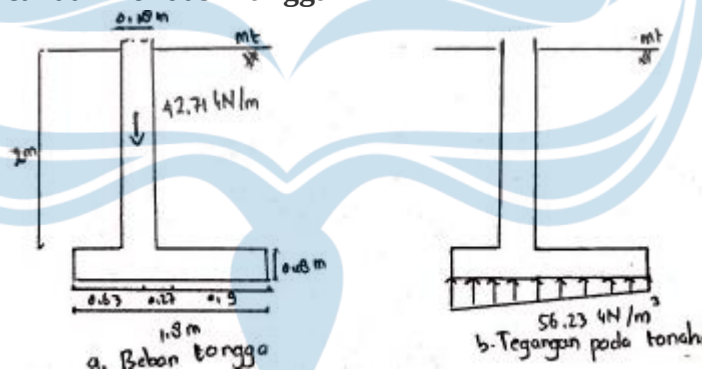
Rencana penulangan sengkang lapangan

Misal digunakan 1p8

$$A_s = 50,29 \text{ mm}^2$$

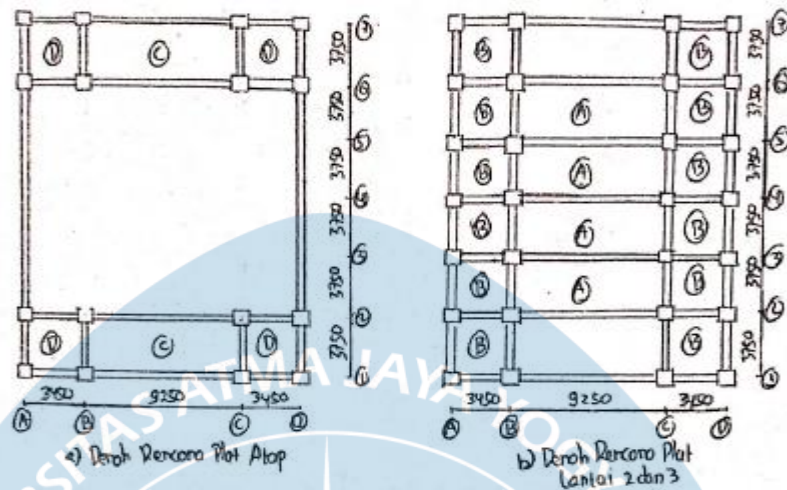
$$S = 350,76 \text{ mm} \rightarrow \text{Maka digunakan } p8-125$$

2.3.3 Perencanaan Pondasi Tangga



Gambar 6. Pondasi Tangga dan Tegangan Tanah

2.3. 4 Perencanaan Pelat Lantai



Gambar 7. Denah Rencana Plat Lantai

1. Pelat C (Atap)

Penulangan arah x

$$A_s = 262,57 \text{ mm}^2$$

$$S = 191,51 \rightarrow \text{Maka digunakan p8-150}$$

Penulangan arah y

$$A_s = 206 \text{ mm}^2$$

$$S = 244,11 \rightarrow \text{Maka digunakan p8-150}$$

2. Pelat D (atap)

Penulangan arah x

$$A_s = 222 \text{ mm}^2$$

$$S = 226,51 \rightarrow \text{Maka digunakan p8-150}$$

Penulangan arah y

$$A_s = 206 \text{ mm}^2$$

$$S = 244,11 \rightarrow \text{Maka digunakan p8-150}$$

3. Pelat A (Lantai)

Penulangan arah x

$$A_s = 435,09 \text{ mm}^2$$

$$S = 180,59 \rightarrow \text{Maka digunakan p10-150}$$

Penulangan arah y

$$A_s = 210 \text{ mm}^2$$

$$S = 374,15 \rightarrow \text{Maka digunakan p10-150}$$

4. Pelat B (Lantai)

Penulangan arah x

$$A_s = 243,17 \text{ mm}^2$$

$$S = 323,12 \rightarrow \text{Maka digunakan p10-150}$$

Penulangan arah y

$$A_s = 234,78 \text{ mm}^2$$

$$S = 324,66 \rightarrow \text{Maka digunakan p10-150}$$

5. Tulang Bagi Pelat Atap

$$A_{s \text{ min}} = 270 \text{ mm}^2$$

$$A_s = 335,238 \geq 270 \text{ (memenuhi syarat)}$$

6. Tulang Bagi Pelat Lantai

$$A_{s \text{ min}} = 280 \text{ mm}^2$$

$$A_s = 335,238 \geq 280 \text{ (memenuhi syarat)}$$

2.4 Perencanaan Balok

Tabel 1. Data Kombinasi Momen Rencana Balok

Lantai	Bentang	Posisi	DL	LL	Ex	Komb 1	Komb 2	Komb 3	Komb 4	Komb 5	Komb 6
						1,4DL	1,2DL + 1,6LL	1,2DL + 1,0LL + 1,0Ex	1,2DL + 1,0LL - 1,0Ex	0,9DL + 1,0Ex	0,9DL - 1,0Ex
2&3	A-B/ C-D	Tum	-23.1	-9.6	67.6	-32.382	-43.084	30.214	-104.886	46.733	-88.367
		Lap	3.5	3.9	0.0	4.858	10.436	8.084	8.084	3.123	3.123
	B-C	Tum	-158.9	-39.4	94.8	-222.432	-253.76	-135.306	-324.886	-48.202	-237.782
		Lap	117.5	28.1	0.0	164.556	185.992	169.138	169.138	105.786	105.786
DAG	A-B/ C-D	Tum	-10.9	-0.9	37.2	-15.274	-14.5384	23.218	-51.21	27.395	-47.033
		Lap	4.7	0.5	0.0	6.5758	6.4076	6.1184	6.1184	4.2273	4.2273
	B-C	Tum	-60.4	-8.5	51.5	-84.6244	-86.1672	-29.5952	-132.5152	-2.9414	-105.8614
		Lap	36.8	5.2	0.0	51.534	52.556	49.412	49.412	33.129	33.129
RING	A-B/ C-D	Tum	-28.9	-0.8	33.5	-40.5244	-36.06	-2.0352	-69.0912	7.4766	-59.5794
		Lap	10.7	0.3	0.0	14.924	13.2864	13.101	13.101	9.594	9.594
	B-C	Tum	-94.6	-3.0	32.9	-132.4022	-118.2892	-83.5986	-149.3786	-52.2257	-118.0057
		Lap	56.1	1.8	0.0	78.5652	70.2056	69.1316	69.1316	50.5062	50.5062

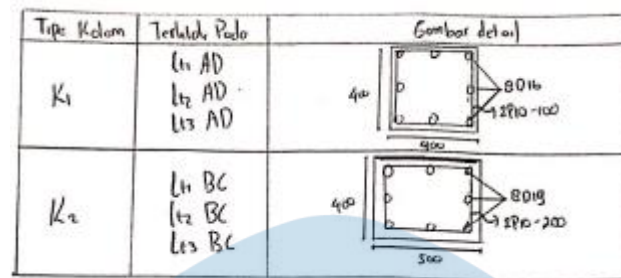
Tabel 2. Data Kombinasi Gaya Geser Rencana Balok

Lantai	Bentang	Posisi	DL	LL	Ex	Komb 1	Komb 2	Komb 3	Komb 4	Komb 5	Komb 6
						1,4DL	1,2DL + 1,6LL	1,2DL + 1,0LL + 1,0Ex	1,2DL + 1,0LL - 1,0Ex	0,9DL + 1,0 Ex	0,9DL - 1,0 Ex
2&3	A-B/ C-D	Tum	26.92	13.32	43.58	37.688	53.616	89.204	2.044	67.808	-19.352
		Lap									
	B-C	Tum	103.9	19.31	21.66	145.46	155.576	165.65	122.33	115.17	71.85
		Lap									
DAG	A-B/ C-D	Tum	13.31	1.913	24.67	18.634	19.0328	42.555	-6.785	36.649	-12.691
		Lap									
	B-C	Tum	40.37	5.501	9.871	56.5124	57.2408	63.8112	44.0692	46.2004	26.4584
		Lap									
RING	A-B/ C-D	Tum	34.43	1.069	22.25	48.2034	43.0276	64.6362	20.1362	53.2379	8.7379
		Lap									
	B-C	Tum	68.92	2.187	5.51	96.488	86.2032	90.401	79.381	67.538	56.518
		Lap									

Balok	Dimensi	Tumpuan	Lapangan
B1 (Lantai 2,3)	300x400 mm mm	P10-100 	P10-100
B2 (Lantai 2,3)	300x600 mm mm	P10-125 	P10-125
B3 (DAG)	250x300 mm mm	P10-80 	P10-80
B4 (DAG)	250x450 mm mm	P10-125 	P10-125
B5 (RING)	250x300 mm mm	P10-80 	P10-80
B6 (RING)	250x450 mm mm	P10-125 	P10-125

Gambar 8. Rencana Balok

2.5 Perencanaan Kolom



Gambar 9. Rencana Kolom

2.6 Perencanaan Pondasi dan Sloof

Tabel 3. Data Kombinasi Gaya Rencana Kolom

Elemen	As	DL	LL	Ex	Ey
P1	A-D	319.38	85.14	83.58	-5.78
P2	B-C	1015.46	242.82	-170	42.54

Elemen	As	KOMBINASI									
		1	2	3	4	5	6	7	8	9	10
P1	A-D	447.132	519.48	551.976	384.816	462.616	474.176	371.022	203.862	281.662	293.222
P2	B-C	1421.64	1607.06	1291.37	1631.37	1503.91	1418.83	743.914	1083.91	956.454	871.374

2.6.1 Perencanaan Pondasi P1

Luas Telapak = 1,9 m

Cek Geser

Digunakan d13, $A_s = 132,902 \text{ kN/m}^2$

Cek geser 1 arah

$$\phi V_l = 294,092 > V_u = 129,714 \text{ (OK)}$$

Cek geser 2 arah

$$\phi V_l = 1601,342 > V_u = 535,935 \text{ (OK)}$$

Perhitungan tulang lentur

$$A_s = 796,714 \text{ mm}^2$$

$$N = 5,002 \rightarrow \text{Maka digunakan } 6d13-150$$

$$\phi M_n = 45,42 > 43,004 \text{ (OK)}$$

Tulangan Bagi

$$A_s = 546,3$$

$$S = 100 \rightarrow \text{Maka digunakan } p10-100$$

2.6.2 Perencanaan Pondasi P2

Luas Telapak = 3,2 m

Cek Geser

Digunakan $A_s = 201,143 \text{ kN/m}^2$

Cek geser 1 arah

Arah x

$$\phi V_l = 790,357 > V_u = 457,804 \text{ (OK)}$$

Arah y

$$\phi V_l = 790,357 > V_u = 483,294 \text{ (OK)}$$

Cek geser 2 arah

$$\phi V_l = 2650,076 > V_u = 508,035 \text{ (OK)}$$

Perhitungan tulang lentur

$$A_s = 1005,714 \text{ mm}^2$$

$$N = 4,638 \rightarrow \text{Maka digunakan } 5d16-200$$

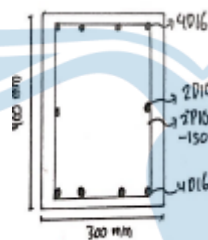
$$\phi M_n = 147,482 > 145,175 \text{ (OK)}$$

Tulangan Bagi

$$A_s = 813,6$$

$$S = 96,573 \rightarrow \text{Maka digunakan } p10-100$$

2.6.3 Perencanaan Sloof



Gambar 10. Rencana Sloof