



UNIVERSITAS ISLAM INDONESIA
FAKULTAS TEKNIK SIPIL DAN PERENCANAAN
JURUSAN TEKNIK SIPIL
Jl. Kaliurang Km. 14,4 Telp. 95330 Yogyakarta

KARTU PESERTA TUGAS AKHIR

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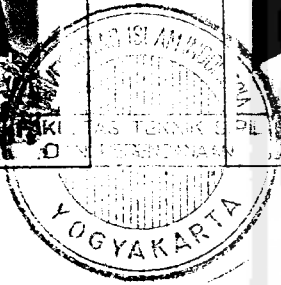
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Yogyakarta, 01 APRIL 1998

Dekan,

Ketua Jurusan Teknik Sipil.



Ir. Bambang Sulistiono, MSCE

Lampiran 1

Gaya-gaya yang terjadi akibat beban gravitasi untuk portal melintang as 3 = as 6

ELM	LETAK m	BEBAN MATI (D)				BEBAN HIDUP (L)				I-4-BEBAN MATI (I-4D)				I-2D + I-6L			
		AKSIAL KN	GESER KN	MOMEN KNm		AKSIAL KN	GESER KN	MOMEN KNm		AKSIAL KN	GESER KN	MOMEN KNm		AKSIAL KN	GESER KN	MOMEN KNm	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
1	Bawah	0	-88,23	-28,86	40,07	-363,05	-13,19	18,32	-1026,32	-40,41	36,1	-1520,76	-55,74	77,41			
	Atas	4		-28,86	-7,38		-13,19	-34,44		-40,41	-103,53		-55,74	-35,26			
2	Bawah	0	-104,39	22,03	-29,38	-500,95	9,64	-12,83	-1461,43	30,83	-41,14	-2054,19	41,87	-55,31			
	Atas	4		22,03	38,75		9,64	25,23		30,83	82,25		41,87	11,56			
3	Bawah	0	-104,39	22,03	-29,38	-500,95	9,64	-12,83	-1461,43	30,83	-41,14	-2054,19	41,87	-55,31			
	Atas	4		22,03	38,75		9,64	25,23		30,83	82,25		41,87	11,56			
4	Bawah	0	-88,23	-28,86	-40,07	-363,05	13,19	-18,32	-1026,32	-40,41	36,1	-1520,76	55,74	-77,41			
	Atas	4		-28,86	7,38		13,19	34,44		-40,41	-103,53		55,74	35,26			
5	Bawah	0	-651,68	-44,99	93,57	-303,02	-20,53	12,7	-912,35	-62,99	120,94	-1266,84	-86,84	80,51			
	Atas	4		-44,99	-86,39		-20,53	-30,42		-62,99	-120,94		-86,84	-66,75			
6	Bawah	0	-866,08	38,38	-80,47	-413,98	16,65	-33,07	-1212,51	33,73	-12,69	-1701,67	72,7	-52,48			
	Atas	4		38,38	73,05		16,65	31,33		33,73	102,28		72,7	38,12			
7	Bawah	0	-866,08	38,38	-80,47	-413,98	-16,65	33,07	-1212,51	-33,73	12,69	-1701,67	-72,7	52,48			
	Atas	4		38,38	73,05		-16,65	-31,33		-33,73	-102,28		-72,7	-38,12			
8	Bawah	0	-651,68	-44,99	93,57	-303,02	20,53	-12,7	-912,35	62,99	-120,94	-1266,84	86,84	-80,51			
	Atas	4		-44,99	-86,39		20,53	30,42		62,99	120,94		86,84	66,75			
9	Bawah	0	-519,71	-43,1	85,76	-242,78	-19,83	39,26	-727,59	-60,34	120,06	-1012,09	-83,46	165,72			
	Atas	4		-43,1	-86,65		-19,83	-40,08		-60,34	-120,06		-83,46	-168,11			
10	Bawah	0	-688,69	34,09	-67,47	-327,22	15,4	-29,84	-964,16	47,73	-94,45	-1349,99	65,55	-128,71			
	Atas	4		34,09	68,9		15,4	31,77		47,73	96,46		65,55	133,31			
11	Bawah	0	-688,69	34,09	-67,47	-327,22	-15,4	29,84	-964,16	-47,73	94,45	-1349,99	-65,55	128,71			
	Atas	4		-34,09	-68,9		-15,4	-31,77		-47,73	-96,46		-65,55	-133,31			
12	Bawah	0	-519,71	-43,1	85,76	-242,78	19,83	-39,26	-727,59	60,34	-120,06	-1012,09	83,46	168,11			
	Atas	4		-43,1	-86,65		19,83	40,08		60,34	120,06		83,46	168,11			
13	Bawah	0	-387,34	-43,55	86,81	-182,27	-18,55	39,56	-542,28	-60,97	121,53	-736,45	-81,95	167,15			
	Atas	4		-43,55	-87,39		-18,55	-34,86		-60,97	-122,31		-81,95	-160,33			
14	Bawah	0	-511,69	34,56	-69,53	-240,73	12,36	-27,9	-716,36	48,39	-97,31	-999,19	61,24	-128,07			
	Atas	4		34,56	68,72		12,36	21,23		48,39	96,1		61,24	116,39			

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
15	Bawan	0	-311,69	-44,56	69,53	-240,73	-42,36	27,9	-716,36	-48,39	97,34	-999,19	-61,24	128,07
	Alas	4		-34,56	-68,72			-21,52		-48,39				
16	Bawan	0	-387,34	43,55	-86,81	-182,27	18,55	-39,36	-542,28	60,97	-121,53	-756,45	81,95	-167,15
	Alas	4		43,55	87,39			34,86		60,97				
17	Bawan	0	-254,83	-41,88	86,7	-121,18	-28,69	45,61	-356,76	-38,63	121,37	-600,67	-96,15	177,01
	Alas	4		-41,88	-80,81			-69,13		-38,63				
18	Bawan	0	-334,83	35,33	-69,31	-154,2	27,03	-40,64	-468,77	49,46	-97,03	-648,33	85,64	-148,2
	Alas	4		35,33	69,31			67,46		49,46				
19	Bawan	0	-334,83	35,33	-69,31	-154,2	27,03	-40,64	-468,77	49,46	-97,03	-648,33	85,64	-148,2
	Alas	4		35,33	69,31			67,46		49,46				
20	Bawan	0	-254,83	-41,88	86,7	-121,18	-28,69	45,61	-356,76	-38,63	121,37	-600,67	-96,15	177,01
	Alas	4		-41,88	-80,81			-69,13		-38,63				
21	Bawan	0	-214,49	-49,23	66,72	-25	17,99	-35,43	-170,98	-68,92	25,69	-185,78	-87,86	204,99
	Alas	2		-49,23	-99,24			-84,52		-68,92				
22	Bawan	0	-158,81	30,82	-62,48	-32	10,28	-20,53	-222,35	43,14	-87,47	-241,78	53,42	-124,34
	Alas	2		30,82	61,9			20,53		43,14				
23	Bawan	0	-158,81	30,82	-62,48	-32	-40,28	30,55	-222,35	-43,14	87,47	-241,78	-53,42	124,34
	Alas	2		-30,82	-61,9			-20,53		-43,14				
24	Bawan	0	-121,49	49,23	-66,72	-25	17,99	-35,43	-170,98	-68,92	25,69	-185,78	87,86	-204,99
	Alas	2		49,23	99,24			84,52		68,92				
25	Kiri	0	16,13	131,55	-168,95	7,34	60,03	-77,15	22,58	84,17	-236,32	31,1	253,91	-326,17
	Kiri	4		0	44,31			42,99		0	132,04		0	181,96
26	Kanan	8		-131,39	-168,32		-39,97	-66,88		-133,95	-233,64		-253,62	-324,98
	Kiri	0	0,22	46,42	29,09	0,33	27	-16,08	0,31	64,99	-40,73	0,27	98,91	-60,64
	Kiri	1,5		0	5,72		0	4,17		0	8,01		0	13,54
27	Kanan	3		-46,42	-29,09		-27	-16,08		-64,99	-40,73		-98,91	-60,64
	Kiri	0	16,13	131,39	-168,32	7,34	59,97	-76,88	22,58	83,95	-233,64	31,1	253,62	-324,98
	Kiri	4		0	44,31		0	42,99		0	132,04		0	181,96
28	Kanan	8		-131,35	-168,95		-60,03	-77,15		-184,17	-236,32		-253,91	-326,17
	Kiri	0	-1,89	131,97	-172,14	0,7	60,24	-78,68	-2,64	84,76	-241	-5,78	254,76	-332,47
	Kanan	8		-130,97	-168,13		-29,76	-76,73		-183,36	-233,38		-252,78	-324,55
29	Kiri	0	2,4	46,42	-27,61	0,55	27	-15,37	3,36	64,99	-38,63	3,76	98,91	-57,72
	Kiri	1,5		0	7,21		0	4,88		0	10,09		0	16,46
30	Kanan	3		-46,42	-27,61		-27	-15,37		-64,99	-38,63		-98,91	-57,72
	Kiri	0	-1,89	130,97	-168,13	0,7	59,76	-76,75	-2,64	83,36	-233,38	-3,38	252,78	-324,55
	Kiri	4		0	42,81		0	42,29		0	129,94		0	179,03
	Kanan	8		-131,97	-172,14		-60,24	-78,68		-184,17	-236,32		-253,91	-326,17
	Kanan	8		-131,97	-172,14		-60,24	-78,68		-184,17	-236,32		-253,91	-326,17

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
31	Kin	0	0.45	132.36	-173.46	-1.28	60.5	-79.44	0.63	183.31	-242.83	-1.51	253.64	-335.26
		4		0	93.06		0	42.58		0	130.28		0	179.8
	Kanan	8		-130.58	-166.33		-39.5	-75.42		-182.81	-232.86		-251.89	-320.27
32	Kin	0	-0.02	46.42	-27.9	1.77	37	-15.76	-0.03	64.99	-39.05	2.8	98.91	-58.68
		1.5		0	6.92		0	4.49		0	9.69		0	15.5
	Kanan	3		-46.42	-27.9		-27	-15.76		-64.99	-39.05		-98.91	-58.68
33	Kin	0	0.45	130.58	-166.33	-1.28	39.5	-75.42	0.63	182.81	-232.86	-1.51	251.89	-320.27
		4		0	93.06		0	42.58		0	130.28		0	179.8
	Kanan	8		-132.36	-173.46		-60.5	-79.44		-185.31	-242.85		-255.64	-335.26
34	Kin	0	-1.67	132.36	-174.08	10.13	60.48	-80.46	-2.34	185.32	-243.72	14.2	255.78	-337.64
		4		0	93.04		0	41.45		0	130.26		0	177.98
	Kanan	8		-130.43	-165.76		-59.52	-75.64		-182.6	-232.06		-251.75	-321.54
35	Kin	0	-2.44	46.42	-27.73	-4.54	27	-14.38	-3.42	64.99	-38.83	-10.2	98.91	-56.44
		1.5		0	7.08		0	5.77		0	9.92		0	17.74
	Kanan	3		-46.42	-27.73		-27	-14.38		-64.99	-38.83		-98.91	-56.44
36	Kin	0	-1.67	130.43	-165.76	10.13	39.52	-76.64	-2.34	182.6	-232.06	14.2	251.75	-321.54
		4		0	93.04		0	41.45		0	130.26		0	177.98
	Kanan	8		-132.31	-174.08		-60.48	-80.46		-185.32	-243.72		-255.78	-337.64
37	Kin	0	7.35	133.34	-177.73	-10.69	96.8	-124.56	10.29	186.68	-248.82	-8.29	314.89	-412.57
		4.1		0	92.75		0	70.65		0	129.85		0	224.33
	Kanan	8		-129.61	-162.77		-95.2	-118.17		-181.44	-227.87		-307.84	-384.39
38	Kin	0	11.86	46.42	-28.27	6.06	27	-19.85	16.61	64.99	-39.58	23.93	98.91	-65.69
		1.5		0	6.54		0	0.4		0	9.16		0	8.49
	Kanan	3		-46.42	-28.27		-27	-19.85		-64.99	-39.58		-98.91	-65.69
39	Kin	0	7.35	129.6	-162.77	-10.69	95.2	-118.17	10.29	181.44	-227.87	-8.29	307.84	-384.39
		3.9		0	92.75		0	70.65		0	129.85		0	224.33
	Kanan	8		-133.34	-177.73		-96.8	-124.56		-186.68	-248.82		-314.89	-412.57
40	Kin	0	-49.23	121.49	-149.21	-17.99	25	-34.52	-68.92	170.08	-208.9	-87.86	185.78	-234.29
		4.1		0	98.35		0	17.54		0	137.7		0	146.06
	Kanan	8		-116.98	-131.18		-23	-26.55		-163.77	-183.55		-177.18	-199.9
41	Kin	0	-18.41	41.83	-39.58	-7.72	9	-6.03	-25.77	38.56	-53.41	-34.44	64.6	-57.14
		1.5		0	8.2		0	0.72		0	11.48		0	-8.69
	Kanan	3		-41.83	-39.58		-9	-6.03		-38.56	-53.41		-64.6	-57.14
42	Kin	0	-49.23	116.98	-131.18	-17.99	23	-36.55	-68.92	163.77	-183.65	-87.86	177.18	-199.9
		3.9		0	98.35		0	17.54		0	137.7		0	146.06
	Kanan	8		-121.49	-149.21		-23	-34.52		-170.08	-208.9		-185.78	-234.29

Lampiran 2.a

Perhitungan Perancangan Kolom Portal Lintang As 3 = As 6
Akibat Beban Gravitasi untuk kolom elemen 1,2,3 dan 4

Elemen		1	2	3	4
Satuan					
P_u	N	1520760	2054190	2054190	1520760
M.atas (M _{1b})	N-mm	77410000	55820000	55820000	77410000
M.bawah (M _{2s})	N-mm	145560000	111660000	111660000	145560000
M _{2s}	N-mm	0	0	0	0
d'	mm	40	40	40	40
φ tul.pokok	mm	22	22	22	22
φ tul.sengk.	mm	10	10	10	10
d	mm	739	739	739	739
β ₁		0,85	0,85	0,85	0,85
KOLOM					
h _k	mm	800	800	800	800
b _k	mm	650	650	650	650
L _k	mm	4000	4000	4000	4000
EKSENTRISITAS					
e mm	mm	39	39	39	39
KEKAKUAN KOLOM					
E _c	MPa	25742,96	25742,96	25742,96	25742,96
β _d < 1		0,62143446	0,63138098	0,63138098	0,62143446
INERSIA KOLOM					
I _g	mm ⁴	2,7733E+10	2,7733E+10	2,7733E+10	2,7733E+10
I _g atas	mm ⁴	2,7733E+10	2,7733E+10	2,7733E+10	2,7733E+10
I _g bawah	mm ⁴	0	0	0	0
INERSIA BALOK					
I _{cr} a.ka	mm ⁴	5716666667	2083333333	5716666667	0
I _{cr} a.ki	mm ⁴	0	5716666667	2083333333	5716666667
I _{cr} b.ka	mm ⁴	0	0	0	0
I _{cr} b.ki	mm ⁴	0	0	0	0
EI kolom					
EI	N-mm ²	1,7613E+14	1,7505E+14	1,7505E+14	1,7613E+14
EI _k atas	N-mm ²	1,7613E+14	1,7505E+14	1,7505E+14	1,7613E+14
EI _k bawah	N-mm ²	0	0	0	0
EI balok					
EI _b a.ka	N-mm ²	1,4716E+14	5,3631E+13	1,4716E+14	0
EI _b a.ki	N-mm ²	0	1,4716E+14	5,3631E+13	1,4716E+14
EI _b b.ka	N-mm ²	0	0	0	0
EI _b a.ki	N-mm ²	0	0	0	0
ψ _A		4,78718031	2,41299887	2,41299887	4,78718031
ψ _B		0	0	0	0

ψ		2,39359016	1,20649943	1,20649943	2,39359016
dipakai k		1,65795296	1,39582058	1,39582058	1,65795296
(k.Lk)/(0,3.hk)		27,6325494	23,2636763	23,2636763	27,6325494
		22<kl/r<100	22<kl/r<100	22<kl/r<100	22<kl/r<100
P_c	N	39483536,9	55366270,8	55366270,8	39483536,9

Pembesaran momen

ΣP_c	N	189699615	189699615	189699615	189699615
ΣP_u	N	7149900	7149900	7149900	7149900
$\delta_b > 1$		1,06298828	1,06053507	1,06053507	1,06298828
$\delta_s > 1$		1,0615549	1,0615549	1,0615549	1,0615549
M_c	N-mm	154728574	118419345	118419345	154728574
e	mm	101,744242	57,647708	57,647708	101,744242

Eksentrisitas balanced=eb

C_b	mm	492,6667	492,6667	492,6667	492,6667
ab	mm	418,766667	418,766667	418,766667	418,766667
f_s	MPa	551,285521	551,285521	551,285521	551,285521
		$f_s > f_y$	$f_s > f_y$	$f_s > f_y$	$f_s > f_y$
dipakai	MPa	f_y	f_y	f_y	f_y
C_c	N	6941057,5	6941057,5	6941057,5	6941057,5
C_s	N	1823712	1823712	1823712	1823712
T_s	N	1823712	1823712	1823712	1823712
P_{nb}	N	6941057,5	6941057,5	6941057,5	6941057,5
M_{nb}	N-mm	2597855932	2597855932	2597855932	2597855932
eb	mm	374,273795	374,273795	374,273795	374,273795

Perulangan

ρ_{bal}	%	2,40%	2,40%	2,40%	2,40%
ρ		0,012	0,012	0,012	0,012
$A_s = A_s'$	mm ²	5764,2	5764,2	5764,2	5764,2
A 1D22	mm ²	379,94	379,94	379,94	379,94
Σ tul.perlu	buah	16	16	16	16
A perlu	mm ²	6079,04	6079,04	6079,04	6079,04
ρ perlu		0,01265544	0,01265544	0,01265544	0,01265544

Jika eb > e, maka keruntuhan kolom berdasarkan desak

P_n	N	9587442,93	10886138,4	14014655,7	12412464,3
P_r	N	6231837,9	7075989,97	9109526,21	8068101,8
$P_r > P_u$		OK	OK	OK	OK

Jika eb < e, maka keruntuhan kolom berdasarkan tarik

m		-	-	-	-
P_n	N	-	-	-	-
P_r	N	-	-	-	-
$P_r > P_n$					

Cek tegangan f_s

a	mm	578,427929	656,780598	845,529756	748,866625
c	mm	680,503446	772,683057	994,740889	881,019559
f_s	MPa	564,731993	568,939399	575,873114	572,758834
$f_s > f_y$		OK	OK	OK	OK

Lampiran 2.b

Perhitungan Perancangan Kolom Portal Lintang As 3 = As 6
Akibat Beban Gravitasi untuk kolom elemen 21,22,23 dan 24

	Elemen Satuan	21	22	23	24
P_u	N	185780	241780	241780	185780
M.atas (M1b)	N-mm	2,05E+08	1,24E+08	1,24E+08	204990000
M.bawah (M2s)	N-mm	2,34E+08	142760000	142760000	234290000
M2s	N-mm	0	0	0	0
d'	mm	40	40	40	40
ϕ tul.pokok	mm	22	22	22	22
ϕ tul.sengk.	mm	10	10	10	10
d	mm	739	589	589	739
β_1		0,85	0,85	0,85	0,85

KOLOM

hk	mm	800	650	650	800
bk	mm	650	650	650	650
Lk	mm	5000	5000	5000	5000

EKSENTRISITAS

e mm	mm	39	34,5	34,5	39
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KEKAKUAN KOLOM

E_c	MPa	25742,96	25742,96	25742,96	25742,96
$\beta_d < 1$		0,76423236	0,76996358	0,76996358	0,76423236

INERSIA KOLOM

I_g	mm ⁴	2,7733E+10	1,4876E+10	1,4876E+10	2,7733E+10
$I_{g,atas}$	mm ⁴	0	0	0	0
$I_{g,bawah}$	mm ⁴	2,7733E+10	2,7733E+10	2,7733E+10	2,7733E+10

INERSIA BALOK

$I_{cr.a.ka}$	mm ⁴	5716666667	2083333333	5716666667	0
$I_{cr.a.ki}$	mm ⁴	0	5716666667	2083333333	5716666667
$I_{cr.b.ka}$	mm ⁴	5716666667	2083333333	5716666667	0
$I_{cr.b.ki}$	mm ⁴	0	5716666667	2083333333	5716666667

EI kolom

EI	N-mm ²	1,6187E+14	8,6542E+13	8,6542E+13	1,6187E+14
EIk.atas	N-mm ²	0	0	0	0
EIk.bawah	N-mm ²	1,6187E+14	1,6135E+14	1,6135E+14	1,6187E+14

EI balok

EIb.a.ka	N-mm ²	1,4716E+14	5,3631E+13	1,4716E+14	0
EIb.a.ki	N-mm ²	0	1,4716E+14	5,3631E+13	1,4716E+14
EIb.b.ka	N-mm ²	1,4716E+14	5,3631E+13	1,4716E+14	0
EIb.b.ki	N-mm ²	0	1,4716E+14	5,3631E+13	1,4716E+14
ψ_A		1,75988136	0,47717566	0,47717566	1,75988136
ψ_B		3,95973306	1,58920997	1,58920997	3,95973306

ψ		2,85980721	1,03319282	1,03319282	2,85980721
dipakai k		1,76817529	1,35223919	1,35223919	1,76817529
$(k.Lk)/(0,3.hk)$		36,8369851	34,6727996	34,6727996	36,8369851
		22<kl/r<100	22<kl/r<100	22<kl/r<100	22<kl/r<100
P_c	N	20418950,5	18665454,9	18665454,9	20418950,5

Pembesaran momen

ΣP_c	N	78168810,8	78168810,8	78168810,8	78168810,8
ΣP_u	N	855120	855120	855120	855120
$\delta_b > 1$		1,01419627	1,02033343	1,02033343	1,01419627
$\delta_s > 1$		1,01711794	1,01711794	1,01711794	1,01711794
M_c	N-mm	237616044	145662800	145662800	237616044
e	mm	1279,01843	602,460087	602,460087	1279,01843

Eksentrisitas balanced=eb

C_b	mm	492,6667	392,6667	392,6667	492,6667
ab	mm	418,766667	333,766667	333,766667	418,766667
f'_s	MPa	551,285521	538,879457	538,879457	567200
		$f'_s > f_y$	$f'_s > f_y$	$f'_s > f_y$	$f'_s > f_y$
dipakai	MPa	f_y	f_y	f_y	f_y
C_c	N	6941057,5	5532182,5	5532182,5	6941057,5
C_s	N	1823712	1481766	1481766	1823712
T_s	N	1823712	1481766	1481766	1823712
P_{nb}	N	6941057,5	5532182,5	5532182,5	6941057,5
M_{nb}	N-mm	2597855932	1688219790	1688219790	2597855932
eb	mm	374,273795	305,163431	305,163431	374,273795

Penulangan

ρ total	%	2,40%	2,40%	2,40%	2,40%
$\rho - \rho'$		0,012	0,012	0,012	0,012
$A_s = A_s'$	mm ²	5764,2	4594,2	4594,2	5764,2
A 1D22	mm ²	379,94	379,94	379,94	379,94
Σ tul.perlu	buah	16	13	13	16
A perlu	mm ²	6079,04	4939,22	4939,22	6079,04
ρ perlu		0,01265544	0,01290119	0,01290119	0,01265544

Jika $eb > e$, maka keruntuhan kolom berdasarkan desak

P_n	N	-	-	-	-
P_t	N	-	-	-	-
$P_r > P_u$					

Jika $eb < e$, maka keruntuhan kolom berdasarkan tarik

m		11,76471	11,76471	11,76471	11,76471
P_n	N	1384448,97	2337746,47	2337746,47	1384448,97
P_r	N	899891,833	1519535,21	1519535,21	899891,833
$P_r > P_n$		OK	OK	OK	OK

Cek tegangan f'_s

a	mm	83,5263332	141,040511	141,040511	83,5263332
c	mm	98,2662744	165,930013	165,930013	98,2662744
f'_s	MPa	355,765646	455,360706	455,360706	355,765646
$f'_s > f_y$		OK	OK	OK	OK

Lampiran 3

Gaya-gaya yang terjadi akibat beban gravitasi untuk portal membujur As A = As D

ELM	LETAK m		BEBAN MATI (D)				BEBAN HIDUP (L)				1-J.BEBAN MATI (1,JD)				1,2D + 1,6L					
			AKSIAL		GESER		MOMEN		AKSIAL		GESER		MOMEN		AKSIAL		GESER		MOMEN	
			KN	KN	KN	KN	KNm	KNm	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15						
1	Bawah	0	-428.53	-10.49	14.51	-183.57	-4.42	6.12	-599.94	-14.69	20.32	-807.95	-19.66	27.2						
	Atas	4		-10.49	-27.45		-4.42	-11.56		-14.69	-38.43		-19.66	-51.44						
2	Bawah	0	-834.35	-0.43	0.84	-355.33	-0.19	0.36	-1168.09	-0.61	1.18	-1569.75	-0.82	1.59						
	Atas	4		-0.43	-0.89		-0.19	-0.38		-0.61	-1.24		-0.82	-1.68						
3	Bawah	0	-617.51	6.85	-9.11	-277.1	2.61	-3.47	-864.51	9.58	-12.76	-1184.37	12.38	-16.48						
	Atas	4		6.85	18.27		2.61	6.96		9.58	25.57		12.38	33.05						
4	Bawah	0	-617.51	-6.85	9.11	-277.1	-2.61	3.47	-864.51	-9.58	12.76	-1184.37	-12.38	16.48						
	Atas	4		-6.85	-18.27		-2.61	-6.96		-9.58	-25.57		-12.38	-33.05						
5	Bawah	0	-834.35	0.43	-0.84	-355.33	0.19	-0.36	-1168.09	0.61	-1.18	-1569.75	0.82	-1.59						
	Atas	4		0.43	0.89		0.19	0.38		0.61	1.24		0.82	1.68						
6	Bawah	0	-428.53	10.49	-14.51	-183.57	4.42	-6.12	-599.94	14.69	-20.32	-807.95	19.66	-27.2						
	Atas	4		10.49	27.45		4.42	11.56		14.69	38.43		19.66	51.44						
7	Bawah	0	-358.6	-17.71	36.1	-154.14	-7.45	15.18	-502.04	-24.8	50.53	-676.95	-33.18	67.61						
	Atas	4		-17.71	-34.76		-7.45	-14.61		-24.8	-48.66		-33.18	-65.09						
8	Bawah	0	-689.02	-0.17	0.07	-294.22	-0.09	0.05	-964.63	-0.24	0.09	-1297.58	-0.35	0.17						
	Atas	4		-0.17	-0.61		-0.09	-0.32		-0.24	-0.85		-0.35	-1.24						
9	Bawah	0	-514.78	12.83	-26.25	-229.64	4.88	-10	-720.69	17.96	-36.75	-986.15	23.2	-47.5						
	Atas	4		12.83	25.07		4.88	9.52		17.96	35.09		23.2	45.31						
10	Bawah	0	-514.78	-12.83	26.25	-229.64	-4.88	10	-720.69	-17.96	36.75	-986.15	-23.2	47.5						
	Atas	4		-12.83	-25.07		-4.88	-9.52		-17.96	-35.09		-23.2	-45.31						
11	Bawah	0	-689.02	0.17	-0.07	-294.22	0.09	-0.05	-964.63	0.24	-0.09	-1297.58	0.35	-0.17						
	Atas	4		0.17	0.61		0.09	0.32		0.24	0.85		0.35	1.24						
12	Bawah	0	-358.6	17.71	-36.1	-154.14	7.45	-15.18	-502.04	24.8	-50.53	-676.95	33.18	-67.61						
	Atas	4		17.71	34.76		7.45	14.61		24.8	48.66		33.18	65.09						
13	Bawah	0	-286.53	-17.98	35.59	-123.84	-7.6	15	-401.21	-25.17	49.82	-542.04	-33.74	66.7						
	Atas	4		-17.98	-36.34		-7.6	-15.4		-25.17	-50.87		-33.74	-68.25						

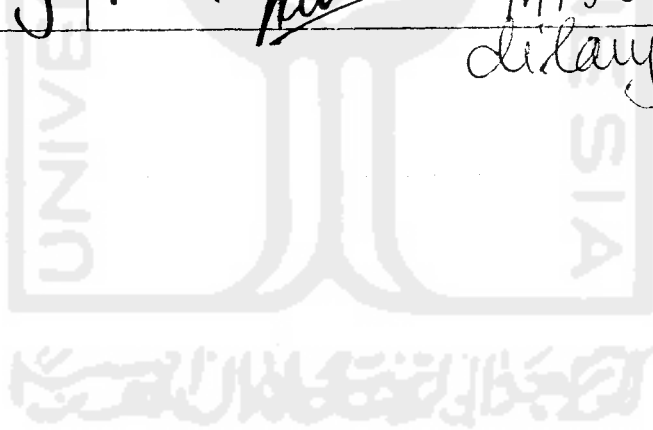
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
14	Bawah	0	-547.25	-0.96	1.86	-234.56	-0.42	0.84	-766.16	-1.34	2.6	-1032	-1.82	3.98
	Atas	4		-0.96	-1.98		-0.42	-0.84		-1.34	-2.78		-1.82	-3.72
15	Bawah	0	-410.58	12.41	-24.53	-181.6	4.81	-9.42	-574.81	17.38	-34.35	-783.25	22.59	-44.52
	Atas	4		12.41	25.13		4.81	9.82		17.38	35.18		22.59	45.86
16	Bawah	0	-410.58	-12.41	24.53	-181.6	-4.81	9.42	-574.81	-17.38	34.35	-783.25	-22.59	44.52
	Atas	4		-12.41	-25.13		-4.81	-9.82		-17.38	-35.18		-22.59	-45.86
17	Bawah	0	-547.25	0.96	-1.86	-234.56	0.42	-0.84	-766.16	1.34	-2.6	-1032	1.82	-3.98
	Atas	4		0.96	1.98		0.42	0.84		1.34	2.78		1.82	3.72
18	Bawah	0	-286.58	17.98	-35.59	-123.84	7.6	-15	-401.21	25.17	-49.82	-542.04	33.74	-66.7
	Atas	4		17.98	36.34		7.6	15.4		25.17	50.87		33.74	68.25
19	Bawah	0	-213.33	-18.91	37.51	-93.03	-7.62	15.63	-298.67	-26.47	52.51	-404.84	-34.88	70.02
	Atas	4		-18.91	-38.12		-7.62	-14.85		-26.47	-53.36		-34.88	-69.49
20	Bawah	0	-407.35	-1.14	2.22	-175.6	-0.7	1.3	-570.29	-1.6	3.1	-769.78	-2.5	4.74
	Atas	4		-1.14	-2.35		-0.7	-1.51		-1.6	-3.3		-2.5	-5.24
21	Bawah	0	-305.74	13.04	-25.94	-133.37	4.5	-9.41	-428.03	18.25	-36.32	-580.28	22.84	-46.19
	Atas	4		13.04	26.21		4.5	9.58		18.25	36.69		22.84	45.17
22	Bawah	0	-305.74	-13.04	25.94	-133.37	-4.5	9.41	-428.03	-18.25	36.32	-580.28	-22.84	46.19
	Atas	4		-13.04	-26.21		-4.5	-8.58		-18.25	-36.69		-22.84	-45.17
23	Bawah	0	-407.35	1.14	-2.22	-175.6	0.7	-1.3	-570.29	1.6	-3.1	-769.78	2.5	-4.74
	Atas	4		1.14	2.35		0.7	1.51		1.6	3.3		2.5	5.24
24	Bawah	0	-213.33	18.91	-37.51	-93.03	7.62	-15.63	-298.67	26.47	-52.51	-404.84	34.88	-70.02
	Atas	4		18.91	38.12		7.62	14.85		26.47	53.36		34.88	69.49
25	Bawah	0	-139.2	-19.01	38.25	-61.58	-10.74	18.35	-194.89	-26.62	53.55	-265.58	-40	75.26
	Atas	4		-19.01	-37.8		-10.74	-24.62		-26.62	-52.92		-40	-84.75
26	Bawah	0	-268.87	-1.58	2.9	-117.8	-0.4	0.81	-376.42	-2.22	4.06	-511.13	-2.55	4.77
	Atas	4		-1.58	-3.43		-0.4	-0.81		-2.22	-4.81		-2.55	-5.42
27	Bawah	0	-200.36	13.07	-26.26	-84.62	7.65	-12.77	-280.5	18.29	-36.76	-375.82	27.92	-51.95
	Atas	4		13.07	26.01		7.65	17.83		18.29	36.41		27.92	59.74
28	Bawah	0	-200.36	-13.07	26.26	-84.62	-7.65	12.77	-280.5	-18.29	36.76	-375.82	-27.92	51.95
	Atas	4		-13.07	-26.01		-7.65	-17.83		-18.29	-36.41		-27.92	-59.74
29	Bawah	0	-268.87	1.58	-2.9	-117.8	0.4	-0.81	-376.42	2.22	-4.06	-511.13	2.55	-4.77
	Atas	4		1.58	3.43		0.4	0.81		2.22	4.81		2.55	5.42
30	Bawah	0	-139.2	19.01	-38.25	-61.58	10.74	-18.35	-194.89	26.62	-53.55	-265.58	40	-75.26
	Atas	4		19.01	37.8		10.74	24.62		26.62	52.92		40	84.75

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
31	Bawah	0	-64.37	-19.14	40.96	-13.59	-7.23	20.45	-90.11	-26.79	57.35	-98.99	-34.53	81.88
	Atas	5		-19.14	-54.71		-7.23	-15.69		-26.79	-76.6		-34.53	-90.76
32	Bawah	0	-131.71	-0.69	1.76	-21.31	-0.56	1.21	-184.39	-0.97	2.47	-192.15	-1.72	4.05
	Atas	5		-0.69	-1.69		-0.56	-1.58		-0.97	-2.36		-1.72	-4.55
33	Bawah	0	-94.37	12.84	-28.3	-19.1	4.91	-14.3	-132.12	17.97	-39.62	-143.8	23.26	-56.84
	Atas	5		12.84	35.88		4.91	10.25		17.97	50.23		23.26	59.44
34	Bawah	0	-94.37	-12.84	28.3	-19.1	-4.91	14.3	-132.12	-17.97	39.62	-143.8	-23.26	56.84
	Atas	5		-12.84	-35.88		-4.91	-10.25		-17.97	-50.23		-23.26	-59.44
35	Bawah	0	-131.71	0.69	-1.76	-21.31	0.56	-1.21	-184.39	0.97	-2.47	-192.15	1.72	-4.05
	Atas	5		0.69	1.69		0.56	1.58		0.97	2.36		1.72	4.55
36	Bawah	0	-64.37	19.14	-40.96	-13.59	7.23	-20.45	-90.11	26.79	-57.35	-98.99	34.53	-81.88
	Atas	5		19.14	54.71		7.23	15.69		26.79	75.6		34.53	90.76
37	Kiri	0	7.22	69.93	-63.54	3.03	29.43	-26.75	10.11	97.9	-88.96	13.51	131	-119.05
		2.9		0	39.33		0	16.55		0	55.06		0	73.67
	Kanan	5		-72.68	-71.79		-30.57	-30.19		-101.75	-100.5		-136.13	-134.45
38	Kiri	0	6.96	72.65	-72.74	2.94	30.54	-30.62	9.74	101.71	-101.84	13.05	136.04	-136.29
		3.1		0	38.29		0	16.01		0	53.6		0	71.55
	Kanan	6		-69.96	-64.67		-29.46	-27.39		-97.94	-90.54		-131.99	-121.43
39	Kiri	0	0.97	32.77	-20.15	0.66	18	-10.44	1.36	45.88	-28.21	2.23	68.13	-40.88
		1.5		0	4.43		0	3.05		0	6.2		0	10.21
	Kanan	3		-32.77	-20.15		-18	-10.44		-45.88	-28.21		-68.13	-40.88
40	Kiri	0	6.96	69.96	-64.67	2.94	29.46	-27.39	9.74	97.94	-90.54	13.05	131.09	-121.43
		2.9		0	38.29		0	16.01		0	53.6		0	71.55
	Kanan	5		-72.65	-72.74		-30.54	-30.62		-101.71	-101.84		-136.04	-136.29
41	Kiri	0	7.22	72.68	-71.79	3.03	30.57	-30.19	10.11	101.75	-100.5	13.51	136.13	-134.45
		3.1		0	39.33		0	16.55		0	55.06		0	73.67
	Kanan	6		-69.93	-63.54		-29.43	-26.75		-97.9	-88.96		-131	-119.05
42	Kiri	0	0.27	72.02	-70.34	0.15	30.3	-29.61	0.37	100.83	-98.48	0.56	134.91	-131.8
		3		0	38.77		-29.7	16.3		0	54.28		0	72.61
	Kanan	6		-70.59	-66.05		-29.7	-27.79		-98.82	-92.47		-132.22	-123.73
43	Kiri	0	1.06	71.18	-68.51	0.48	29.96	-28.96	1.48	99.65	-95.92	2.04	133.35	-128.55
		3		0	38.07		0	15.93		0	53.29		0	71.17
	Kanan	6		-71.43	-69.26		-30.04	-29.18		-100	-96.97		-133.77	-129.81

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
44	Kiri	0	1.47	32.77	-19.66	0.55	18	-10.24	2.06	45.88	-27.53	2.64	68.13	-39.98
		1.5		0	4.91		0	3.26		0	6.88		0	11.11
	Kanan	3		-32.77	-19.66		-18	-10.24		-45.88	-27.53		-68.13	-39.98
45	Kiri	0	1.06	71.43	-69.26	0.48	30.04	-29.18	1.48	100	-96.97	2.04	133.77	-129.81
		3		0	38.07		0	15.93		0	53.29		0	71.17
	Kanan	6		-71.18	-68.51		-29.96	-28.96		-99.65	-95.92		-133.35	-128.55
46	Kiri	0	0.27	70.59	-66.05	0.15	29.7	-27.79	0.37	98.82	-92.47	0.56	132.22	-123.73
		3		0	38.77		0	16.3		0	54.28		0	72.61
	Kanan	6		-72.02	-70.34		-30.3	-29.61		-100.83	-98.48		-134.91	-131.8
47	Kiri	0	0.93	73.25	-73.84	0.02	30.81	-31.03	1.3	102.54	-103.38	1.14	137.2	-138.27
		3.1		0	39.02		0	16.44		0	54.62		0	73.13
	Kanan	6		-69.36	-62.2		-29.19	-26.14		-97.11	-87.07		-129.93	-116.47
48	Kiri	0	1.11	70.54	-66.39	0.3	29.78	-28.29	1.55	98.76	-92.95	1.81	132.29	-124.93
		3		0	38.28		0	16.04		0	53.59		0	71.61
	Kanan	6		-72.07	-70.98		-30.22	-29.63		-100.9	-99.37		-134.84	-132.59
49	Kiri	0	0.49	32.77	-19.91	0.61	18	-10.4	0.68	45.88	-27.87	1.56	68.13	-40.53
		1.5		0	4.67		0	3.1		0	6.54		0	10.56
	Kanan	3		-32.77	-19.91		-18	-10.4		-45.88	-27.87		-68.13	-40.53
50	Kiri	0	1.11	72.07	-70.98	0.3	30.22	-29.63	1.55	100.9	-99.37	1.81	134.84	-132.59
		3		0	38.28		0	16.04		0	53.59		0	71.61
	Kanan	6		-70.54	-66.39		-29.78	-28.29		-98.76	-92.95		-132.29	-124.93
51	Kiri	0	0.93	69.36	-62.2	0.02	29.19	-26.14	1.3	97.11	-87.07	1.14	129.93	-116.47
		2.9		0	39.02		0	16.44		0	54.62		0	73.13
	Kanan	6		-73.25	-73.84		-30.81	-31.03		-102.54	-103.38		-137.2	-138.27
52	Kiri	0	0.11	74.13	-76.36	3.12	31.44	-33.2	0.15	103.78	-106.91	5.13	139.26	-144.76
		3.1		0	39.24		0	16.23		0	54.93		0	73.06
	Kanan	6		-68.48	-59.41		-28.56	-24.54		-95.87	-83.17		-127.87	-110.56
53	Kiri	0	0.55	70	-64.66	2.82	29.24	-26.86	0.77	98	-90.53	5.18	130.79	-120.57
		2.9		0	38.42		0	15.89		0	53.79		0	71.53
	Kanan	6		-72.61	-72.48		-30.76	-31.41		-101.65	-101.47		-136.24	-137.23
54	Kiri	0	0.52	32.77	-20.02	-0.33	18	-10.06	0.72	45.88	-28.02	0.1	68.13	-40.11
		1.5		0	4.56		0	3.44		0	6.39		0	10.98
	Kanan	3		-32.77	-20.02		-18	-10.06		-45.88	-28.02		-68.13	-40.11

CATATAN - KONSULTASI

No.	Tanggal	Konsultasi ke:	KETERANGAN	Paraf
1	27/5/48	Perbaiki sesuai pengarahan		<i>[Signature]</i>
	8/6/48	- lanjutkan	<i>[Signature]</i>	
	18/6/48	- serahkan	<i>[Signature]</i>	
	22/6/48	- lanjutkan & siapkan seminar	<i>[Signature]</i>	
	27/7/48	- Perbaiki portrel	<i>[Signature]</i>	
	28/7/48	- Aco dimensi portrel,	Konsultan PI	<i>[Signature]</i>
		$h_L \rightarrow 60$ $h_M \rightarrow 50$ } ?	3/9/48 \rightarrow Check ulang beban	
	11/10/48	- lanjutkan	<i>[Signature]</i>	
	11/9/48	- lanjutkan	<i>[Signature]</i>	
	16/10/48	- lanjutkan	<i>[Signature]</i> \rightarrow pembahasan	
	22/10/48	- lanjutkan	<i>[Signature]</i>	
	27/10/48	Perbaiki	<i>[Signature]</i>	
	25/11/48	- lanjutkan	<i>[Signature]</i>	
			12/11/48 lanjutkan	
			30/11/48: Aco dapat	
			dilanjutkan ke DP I	<i>[Signature]</i>



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
55	Kiri	0	0.55	72.61	-72.48	2.82	30.76	-31.41	0.77	101.65	-101.47	5.18	136.34	-137.23
				0	38.42		0	15.89		0	53.79		0	71.53
	Kanan	6		-70	-64.66		-29.24	-26.86		-98	-90.53		-130.79	-120.57
56	Kiri	0	0.11	68.48	-59.41	3.12	28.56	-24.54	0.15	95.87	-83.17	5.13	127.87	-110.56
		2.9		0	39.24		0	16.23		0	54.93		0	73.06
	Kanan	6		-74.13	-76.36		-31.44	-33.2		-103.78	-106.91		-139.26	-144.76
57	Kiri	0	0.12	74.34	-78.76	-3.51	47.99	-45.07	0.17	104.77	-110.27	-5.48	166.59	-166.63
		3.1		0	39.05		0	26.9		0	54.68		0	89.75
	Kanan	6		-67.77	-57.59		-48.01	-45.13		-94.88	-80.59		-158.14	-141.29
58	Kiri	0	-0.77	99.39	-62.76	-3.36	48.48	-47.15	-1.08	97.15	-87.87	-6.3	160.84	-150.75
		2.9		0	38.54		0	26.3		0	53.96		0	88.25
	Kanan	6		-73.21	-74.23		-47.52	-44.27		-102.5	-103.92		-163.89	-159.9
59	Kiri	0	-0.54	32.77	-19.91	-0.62	18	-12.14	-0.75	45.88	-27.88	-1.64	68.13	-43.32
		1.5		0	4.67		0	1.36		0	6.53		0	7.78
	Kanan	3		-32.77	-19.91		-18	-12.14		-45.88	-27.88		-68.13	-43.32
60	Kiri	0	-0.77	73.21	-74.23	-3.36	47.52	-44.27	-1.08	102.5	-103.92	-6.3	163.89	-159.9
		3.1		0	38.54		0	26.3		0	53.96		0	88.25
	Kanan	6		-69.39	-62.76		-48.48	-47.15		-97.15	-87.87		-160.84	-150.75
61	Kiri	0	0.12	67.77	-57.56	-3.51	48.01	-45.13	0.17	94.88	-80.59	-5.48	158.14	-141.29
		2.9		0	39.05		0	26.9		0	54.68		0	89.75
	Kanan	6		-74.84	-78.76		-47.99	-45.07		-104.77	-110.27		-166.59	-166.63
62	Kiri	0	-19.14	64.37	-54.71	-7.23	13.59	-15.69	-26.79	90.11	-76.6	-24.53	98.99	-90.76
		3		0	40.63		0	7.4		0	56.88		0	60.11
	Kanan	6		-66	-59.61		-10.41	-6.14		-92.41	-83.46		-95.85	-81.35
63	Kiri	0	-19.83	65.71	-61.3	-7.79	10.9	-7.71	-27.76	91.99	-85.82	-36.25	96.29	-85.91
		3		0	38.05		0	7.14		0	53.28		0	56.87
	Kanan	6		-64.66	-58.15		-13.1	-14.3		-90.52	-81.42		-98.55	-92.66
64	Kiri	0	-5.99	29.71	-22.28	-2.88	6	-4.05	-9.79	41.6	-31.19	-12.99	45.25	-33.22
		1.5		0	0		0	0.45		0	0.01		0	0.72
	Kanan	3		-29.71	-22.28		-6	-4.05		-41.6	-31.19		-45.25	-33.22
65	Kiri	0	-19.83	64.66	-58.15	-7.79	13.1	-14.3	-27.76	90.52	-81.42	-36.25	98.55	-92.66
		3		0	38.05		0	7.14		0	53.28		0	56.87
	Kanan	6		-65.71	-61.3		-10.9	-7.71		-91.99	-85.82		-96.29	-85.91
66	Kiri	0	-19.14	66	-59.61	-7.23	10.41	-6.14	-26.79	92.4	-83.46	-34.53	95.85	-81.35
		3		0	40.63		0	7.4		0	56.88		0	60.11
	Kanan	6		-64.37	-54.71		-13.59	-15.69		-30.11	-76.3		-98.99	-90.76

Lampiran 4

Perhitungan Perancangan Kolom Portal Bujur As A = As D Akibat Beban Gravitasi

	Elemen	2	32
	Satuan		
P_u	N	1565420	191370
M.atas (M1b)	N-mm	2010000	3.79E+06
M.bawah (M2b)	N-mm	2120000	4.63E+06
M2s	N-mm	0	0
d'	mm	40	40
ϕ tul.pokok	mm	22	22
ϕ tul.sengk.	mm	10	10
d	mm	589	589
β_1		0.85	0.85

KOLOM

h _k	mm	650	650
b _k	mm	800	800
L _k	mm	4000	5000

EKSENTRISITAS

e _{nom}	mm	34.5	34.5
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KEKAKUAN KOLOM

E _c	MPa	25742.96	25742.96
$\beta_d < 1$		0.63396226	3.94E-01

INERSIA KOLOM

I _g	mm ⁴	1.8308E+10	1.8308E+10
I _{g atas}	mm ⁴	1.8308E+10	0
I _{g bawah}	mm ⁴	0	1.8308E+10

INERSIA BALOK

I _{er.a.ka}	mm ⁴	5716666667	5716666667
I _{er.a.ki}	mm ⁴	5716666667	5716666667
I _{er.b.ka}	mm ⁴	0	5716666667
I _{er.b.ki}	mm ⁴	0	5716666667

EI kolom

EI	N-mm ²	1.1538E+14	1.3524E+14
EI _{k atas}	N-mm ²	1.1538E+14	0
EI _{k bawah}	N-mm ²	0	1.3524E+14

EI balok

EI _{b.a.ka}	N-mm ²	1.4716E+14	1.4716E+14
EI _{b.a.ki}	N-mm ²	1.4716E+14	1.4716E+14
EI _{b.b.ka}	N-mm ²	0	1.4716E+14
EI _{b.b.ki}	N-mm ²	0	1.4716E+14
ψ_A		1.17602125	0.55140311
ψ_B		0	1.240657

ψ		0.58801062	0.89603006
dipakai k		1.22311348	1.31527401
$(k.L_k)/(0,3.h_k)$		25.0895072	33.7249747
P_c	N	$22 < kl/r < 100$	$22 < kl/r < 100$
		47525979.1	30832314.2

Pembesaran momen

ΣP_c	N	258285862	153417887
ΣP_u	N	7124140	869880
$\delta_b > 1$		1.05337909	1.00964098
$\delta_s > 1$		1.04431492	1.00879984
M_c	N-mm	2233163.66	4.67E+06
e	mm	1.42655879	2.44E+01

Eksentrisitas balanced=eb

C_b	mm	392.6667	392.6667
ab	mm	333.766667	333.766667
f'_s	MPa	538.879457	538.879457
dipakai	MPa	$f'_s > f_y$	$f'_s > f_y$
C_c	N	6808840	6808840
C_s	N	1709730	1709730
T_s	N	1709730	1709730
P_{nb}	N	6808840	6808840
M_{nb}	N-mm	2015232855	2015232855
eb	mm	295.973008	295.973008

Penulangan

ρ total	%	2.40%	2.40%
$\rho = f'_c$		0.012	0.012
$A_s = A'_s$	mm ²	5654.4	5654.4
A 1D22	mm ²	379.94	379.94
Σ tul.perlu	buah	15	15
A perlu	mm ²	5699.1	5699.1
ρ perlu		0.01209486	0.01209486

Jika $eb > e$, maka keruntuhan kolom berdasarkan desak

P_n	N	14392046.6	14392046.6
P_r	N	9354830.3	9354830.3
$P_r > P_n$		OK	OK

Jika $eb < e$, maka keruntuhan kolom berdasarkan tarik

m		-	-
P_n	N	-	-
P_t	N	-	-
$P_r > P_n$		-	-

Cek tegangan f'_s

a	mm	705.492481	705.492481
c	mm	829.991155	829.991155
f'_s	MPa	571.084029	571.084029
$f'_s > f_y$		OK	OK

Lampiran 5

Gaya-gaya yang terjadi akibat beban gravitasi untuk portal membujur As B = As C

ELM	LETAK m	BEBAN MATI (D)			BEBAN HIDUP (L)			I.4. BEBAN MATI (I.4D)			I.2D + I.6L			
		AKSIAL KN	GESER KN	MOMEN KNm	AKSIAL KN	GESER KN	MOMEN KNm	AKSIAL KN	GESER KN	MOMEN KNm	AKSIAL KN	GESER KN	MOMEN KNm	
1	2	4	5	6	7	8	9	10	11	12	13	14	15	
1	Bawah	0	-549.64	13.51	18.69	-251.88	-6.08	3.42	769.5	-18.91	26.17	1042.58	-25.94	35.9
	Atas	4		-13.51	-35.35		-6.08	-15.91		-18.91	-49.49		-25.94	-67.87
2	Bawah	0	-1075.22	0.56	1.09	-489.39	-0.26	0.5	1505.31	0.79	1.53	2073.29	-1.08	2.11
	Atas	4		-0.56	-1.16		-0.26	-0.53		-0.79	-1.62		-1.08	-2.23
3	Bawah	0	-798.02	8.76	11.66	-380.73	3.59	4.77	1117.03	12.26	16.33	1566.8	16.25	43.36
	Atas	4		8.76	23.37		3.59	9.57		12.26	32.72		16.25	43.36
4	Bawah	0	-798.02	-8.76	11.66	-380.73	-3.59	4.77	1117.03	-12.26	16.33	1566.8	-16.25	21.62
	Atas	4		-8.76	23.37		-3.59	9.57		-12.26	-32.72		-16.25	-43.36
5	Bawah	0	-1075.22	0.56	-1.09	-489.39	0.26	-0.5	-1505.31	0.79	-1.53	-2073.29	1.08	-2.11
	Atas	4		0.56	1.16		0.26	0.53		0.79	1.62		1.08	2.23
6	Bawah	0	-549.64	13.51	18.69	-251.88	5.08	-3.42	769.5	18.91	-26.17	-1042.58	25.94	-35.9
	Atas	4		13.51	35.35		5.08	-15.31		18.91	49.49		25.94	67.87
7	Bawah	0	-459.52	-22.81	46.49	-211.41	-10.25	20.89	643.47	-31.94	55.08	-889.8	-43.78	89.21
	Atas	4		-22.81	-44.77		-10.25	-20.11		-31.94	-62.68		-43.78	-85.9
8	Bawah	0	-888.18	-0.23	0.11	-405.37	-0.13	0.08	-1243.46	-0.32	0.15	-1714.42	-0.49	0.25
	Atas	4		-0.23	-0.82		-0.13	-0.45		-0.32	-1.14		-0.49	-1.69
9	Bawah	0	-664.96	16.42	33.59	-315.47	6.71	-13.76	930.94	22.98	-47.03	-1302.7	30.44	-62.32
	Atas	4		16.42	32.07		6.71	13.09		22.98	44.9		30.44	59.43
10	Bawah	0	-664.96	-16.42	33.59	-315.47	-6.71	13.76	-930.94	-22.98	47.03	-1302.7	-30.44	62.32
	Atas	4		-16.42	-32.07		-6.71	-13.09		-22.98	-44.9		-30.44	-59.43
11	Bawah	0	-888.18	0.23	-0.11	-405.37	0.13	-0.08	-1243.46	0.32	-0.15	-1714.42	0.49	-0.25
	Atas	4		0.23	0.82		0.13	0.45		0.32	1.14		0.49	1.69
12	Bawah	0	-459.52	22.81	-46.49	-211.41	10.25	-20.89	-643.47	31.94	-55.08	-889.8	43.78	-89.21
	Atas	4		22.81	44.77		10.25	20.11		31.94	62.68		43.78	85.9
13	Bawah	0	-366.89	-23.18	45.86	-169.73	-10.47	20.65	-513.65	-32.45	54.2	-711.83	-44.56	98.07
	Atas	4		-23.18	-46.85		-10.47	21.22		-32.45	-55.59		-44.56	-90.18

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
14	Bawah	0	-705.74	-1.25	2.43	-323.37	-0.57	1.15	-988.04	-1.76	3.41	-1364.28	-2.42	4.77
	Atas	4		-1.25	-2.56		-0.57	-1.14		-1.76	-3.61		-2.42	-4.92
15	Bawah	0	-530	15.91	-31.42	-249.4	6.64	-12.99	-742	22.28	-43.99	-1035.05	29.71	-58.48
	Atas	4		15.91	32.22		6.64	13.56		22.28	45.11		29.71	60.36
16	Bawah	0	-530	-15.91	31.42	-249.4	-6.64	12.99	-742	-22.28	43.99	-1035.05	-29.71	58.48
	Atas	4		-15.91	-32.22		-6.64	-13.56		-22.28	-45.11		-29.71	-60.36
17	Bawah	0	-705.74	1.25	-2.43	-323.37	0.57	-1.15	-988.04	1.76	-3.41	-1364.28	2.42	-4.77
	Atas	4		1.25	2.56		0.57	1.14		1.76	3.61		2.42	4.92
18	Bawah	0	-366.89	23.18	-45.86	-169.73	10.47	-20.65	-513.63	32.45	-64.2	-711.83	44.56	-88.07
	Atas	4		23.18	46.85		10.47	21.22		32.45	65.59		44.56	90.18
19	Bawah	0	-272.57	-24.3	48.32	-127.34	-10.44	21.5	-381.5	-34.01	67.64	-530.82	-45.85	92.38
	Atas	4		-24.3	-48.87		-10.44	-20.24		-34.01	-68.42		-45.85	-91.03
20	Bawah	0	-525.7	-1.56	2.99	-242.32	-1.01	1.85	-735.98	-2.18	4.19	-1018.56	-3.48	6.55
	Atas	4		-1.56	-3.24		-1.01	-2.18		-2.18	-4.53		-3.48	-7.36
21	Bawah	0	-394.24	16.56	-33.08	-183.09	6.12	-12.89	-551.93	23.19	-46.31	-766.03	29.66	-60.32
	Atas	4		16.56	33.17		6.12	11.58		23.19	46.43		29.66	58.33
22	Bawah	0	-394.24	-16.56	33.08	-183.09	-6.12	12.89	-551.93	-23.19	46.31	-766.03	-29.66	60.32
	Atas	4		-16.56	-33.17		-6.12	-11.58		-23.19	-46.43		-29.66	-58.33
23	Bawah	0	-525.7	1.56	-2.99	-242.32	1.01	-1.85	-735.98	-2.18	4.19	-1018.56	3.48	-6.55
	Atas	4		1.56	3.24		1.01	2.18		2.18	4.53		3.48	7.36
24	Bawah	0	-272.57	24.3	-48.32	-127.34	10.44	-21.5	-381.5	34.01	-67.64	-530.82	45.85	-92.38
	Atas	4		24.3	48.87		10.44	20.24		34.01	68.42		45.85	91.03
25	Bawah	0	-177.04	-25.26	49.83	-84.04	-15.31	25.66	-247.86	-35.37	69.76	-346.91	-54.81	100.84
	Atas	4		-25.26	-51.22		-15.31	-35.59		-35.37	-71.7		-54.81	-118.4
26	Bawah	0	-347.65	-1.97	3.59	-162.99	-0.49	0.98	-486.71	-2.76	5.03	-677.96	-3.16	5.88
	Atas	4		-1.97	-4.31		-0.49	-0.99		-2.76	-6.03		-3.16	-6.75
27	Bawah	0	-257.69	17.46	-34.38	-115.98	10.99	-18.07	-360.76	24.44	-48.13	-494.79	38.53	-70.16
	Atas	4		17.46	35.45		10.99	25.89		24.44	48.64		38.53	83.98
28	Bawah	0	-257.69	-17.46	34.38	-115.98	-10.99	18.07	-360.76	-24.44	48.13	-494.79	-38.53	70.16
	Atas	4		-17.46	-35.45		-10.99	-25.89		-24.44	-49.64		-38.53	-83.98
29	Bawah	0	-347.65	1.97	-3.59	-162.99	0.49	-0.98	-486.71	2.76	-5.03	-677.96	3.16	-5.88
	Atas	4		1.97	4.31		0.49	0.99		2.76	6.03		3.16	6.75
30	Bawah	0	-177.04	25.26	-49.83	-84.04	15.31	-25.66	-247.86	35.37	-69.76	-346.91	54.81	-100.84
	Atas	4		25.26	51.22		15.31	35.59		35.37	71.7		54.81	118.4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
31	Bawah	0	-81.15	-22.64	48.4	-18.35	-9.06	25.18	-113.61	-31.7	67.75	-126.73	-41.67	98.37
	Atas	5		-22.64	-64.83		-9.06	-20.13		-31.7	-90.76		-41.67	-110.01
32	Bawah	0	-170.38	-0.78	2.09	-29.85	-0.68	1.51	-238.53	-1.09	2.92	-252.21	-2.02	4.92
	Atas	5		-0.78	-1.8		-0.68	-1.9		-1.09	-2.51		-2.02	-5.2
33	Bawah	0	-120.73	14.71	-32.35	-26.06	6.02	-17.24	-169.03	20.6	-45.3	-186.57	27.29	-66.41
	Atas	5		14.71	41.22		6.02	12.87		20.6	57.7		27.29	70.05
34	Bawah	0	-120.73	-14.71	32.35	-26.06	-6.02	17.24	-169.03	-20.6	45.3	-186.57	-27.29	66.41
	Atas	5		-14.71	-41.22		-6.02	-12.87		-20.6	-57.7		-27.29	-70.05
35	Bawah	0	-170.38	0.78	-2.09	-29.85	0.68	-1.51	-238.53	1.09	-2.92	-252.21	2.02	-4.92
	Atas	5		0.78	1.8		0.68	1.9		1.09	2.51		2.02	5.2
36	Bawah	0	-81.15	22.64	-48.4	-18.35	9.06	-25.18	-113.61	31.7	-67.75	-126.73	41.67	-98.37
	Atas	5		22.64	64.83		9.06	20.13		31.7	90.76		41.67	110.01
37	Kiri	2.9	9.3	90.03	-81.83	4.17	40.47	-36.8	13.03	126.04	-114.57	17.83	172.78	-157.08
					50.62		0	22.75		0	70.87		0	97.16
38	Kiri	0	8.97	-93.53	-92.36	4.04	-42.03	-41.49	12.56	-130.95	-129.3		-179.49	-177.21
		3.1			49.26		0	22.01		130.9	-131.07	17.24	179.38	-179.69
39	Kanan	6		-90.06	-83.29		-40.51	-37.68		-126.08	-116.6		-172.89	-160.23
		1.5	1.32	43.01	-26.32	0.92	24.75	-14.35	1.84	60.21	-36.85	3.04	91.21	-54.55
40	Kanan	3		-13.01	-26.32		-24.75	-14.35		-60.21	-36.85		-91.21	-54.55
		2.9	8.97	30.06	-83.29	4.04	40.51	-37.68	12.56	126.08	-116.6	17.24	172.89	-160.23
41	Kanan	6		-93.51	-93.62		-41.99	-42.09	13.03	-130.95	-129.3	17.83	-179.38	-179.69
		3.1	9.3	93.53	-92.36	4.17	42.03	-41.49		130.95	-129.3		179.49	-177.21
42	Kiri	0	0.36		49.9	0.22	0	22.41	0.51	0	70.87	0.79	0	97.16
		3			50.62		0	22.75		0	68.97		0	94.33
43	Kanan	6		-90.83	-84.93		-40.82	-38.18		-126.04	-114.57		-172.78	-157.08
		3	1.39	91.61	-88.18	0.66	41.19	-39.78	1.94	128.26	-123.45	2.72	175.83	-169.46
44	Kanan	6		-91.95	-89.19		-41.31	-40.15		-128.73	-124.86		-176.44	-171.28
		0	1.89	43.01	-25.7	0.74	24.75	-14.08	2.65	60.21	-35.98	3.45	91.21	-53.36
		1.5			5.56		0	4.48		0	9.18		0	15.04
	Kanan	3		-43.01	-25.7		-24.75	-14.08		-60.21	-35.98		-91.21	-53.36

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
45	Kin	0	1,39	91,95	-89,19	0,66	41,31	-40,16	1,94	128,73	-124,86	2,72	176,44	-171,28
		3		0	48,99		0	21,91		0	68,58		0	93,83
	Kanan	6		-91,61	-88,18		-41,19	-39,78		-128,26	-123,45		-175,83	-169,46
46	Kin	0	0,36	90,83	-84,93	0,22	40,82	-38,18	0,51	127,16	-118,9	0,79	174,31	-163
		3		0	49,9		0	22,41		0	69,86		0	95,75
	Kanan	6		-92,73	-90,63		-41,68	-40,76		-129,82	-126,88		-177,96	-173,97
47	Kin	0	1,12	94,32	-95,17	-0,03	42,39	-42,72	1,57	132,05	-133,23	1,29	181,01	-182,56
		3,1		0	50,23		0	-2,62		0	70,33		0	96,47
	Kanan	6		-89,24	-79,92		-40,11	-35,88		-124,93	-111,88		-171,26	-153,31
48	Kin	0	1,42	90,81	-85,49	0,4	40,93	-38,86	1,99	127,13	-119,69	2,35	174,46	-164,77
		3		0	49,27		0	22,07		0	68,98		0	94,43
	Kanan	6		-92,75	-91,34		-41,57	-40,76		-129,85	-127,87		-177,81	-174,82
49	Kin	0	0,77	43,01	-26,03	0,92	24,75	-14,31	1,08	60,21	-36,44	2,4	91,21	-54,14
		1,5		0	6,23		0	4,25		0	3,72		0	14,27
	Kanan	3		-43,01	-26,03		-24,75	-14,31		-60,21	-36,44		-91,21	-54,14
50	Kin	0	1,42	92,75	-91,34	0,4	41,57	-40,76	1,99	129,85	-127,87	2,35	177,81	-174,82
		3		0	49,27		0	22,07		0	68,98		0	94,43
	Kanan	6		-90,81	-85,49		-40,93	-38,86		-127,13	-119,69		-174,46	-164,77
51	Kin	0	1,12	89,24	-79,92	-0,03	40,11	-35,88	1,57	124,93	-111,88	1,29	171,26	-153,31
		2,9		0	50,23		0	22,62		0	70,33		0	96,47
	Kanan	6		-94,32	-95,17		-42,39	-42,72		-132,05	-133,23		-181,01	-182,56
52	Kin	0	0,96	95,53	-96,7	4,88	43,3	-45,9	1,35	133,74	-138,17	8,96	183,91	-191,88
		3,1		0	50,44		0	22,28		0	70,62		0	96,17
	Kanan	6		-88,03	-76,21		-39,2	-33,6		-123,24	-106,7		-168,36	-145,21
53	Kin	0	1,38	90,02	-83,04	4,36	40,14	-36,75	1,93	126,03	-116,26	8,64	172,24	-158,45
		2,9		0	49,4		0	21,83		0	69,16		0	94,2
	Kanan	6		-93,54	-93,61		-42,36	-43,42		-130,96	-131,05		-180,03	-181,8
54	Kin	0	0,49	43,01	-26,06	-0,51	24,75	-13,78	0,68	60,21	-36,49	-0,24	91,21	-53,32
		1,5		0	6,19		0	4,79		0	8,67		0	15,09
	Kanan	3		-43,01	-26,06		-24,75	-13,78		-60,21	-36,49		-91,21	-53,32
55	Kin	0	1,38	93,54	-93,61	4,36	42,36	-43,42	1,93	130,96	-131,05	8,64	180,03	-181,8
		3,1		0	49,4		0	21,83		0	69,16		0	94,2
	Kanan	6		-90,02	-83,04		-40,14	-36,75		-126,03	-116,26		-172,24	-158,45
56	Kin	0	0,96	88,03	-76,21	4,88	39,2	-33,6	1,35	123,24	-106,7	8,96	168,36	-145,21
		2,9		0	50,44		0	22,28		0	70,62		0	96,17
	Kanan	6		-95,53	-96,7		-43,3	-45,9		-133,74	-138,17		-183,91	-191,88

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
57	Kiri	0	-2.62	95.89	-99.61	-6.25	65.69	-60.77	-3.66	134.25	-139.46	-13.14	220.18	-216.77
		3.1		0	50.68		0	37.31		0	70.95		0	120.31
	Kanan	6		-87.66	-74.92		-66.31	-62.62		-122.73	-104.89		-211.29	-190.1
58	Kiri	0	-3.81	89.61	-81.31	-6.06	66.83	-65.12	-5.34	125.46	-113.84	-14.27	214.46	-201.77
		2.9		0	49.93		0	36.39		0	69.9		0	118.03
	Kanan	6		-93.95	-94.32		-65.17	-60.14		-131.52	-132.04		-217.01	-209.4
59	Kiri	0	-1.07	43.01	-26.51	-1.09	24.75	-17	-1.5	60.21	-37.11	-3.03	91.21	-59.01
		1.5		0	5.75		0	1.56		0	8.05		0	9.4
	Kanan	3		-43.01	-26.51		-24.75	-17		-60.21	-37.11		-91.21	-59.01
60	Kiri	0	-3.81	93.95	-94.32	-6.06	65.17	-60.14	-5.34	131.52	-132.04	-14.27	217.01	-209.4
		3.1		0	49.93		0	36.39		0	69.9		0	118.03
	Kanan	6		-89.61	-81.31		-66.83	-65.12		-125.46	-113.84		-214.46	-201.77
61	Kiri	0	-2.52	87.66	-74.92	-6.25	66.31	-62.62	-3.66	122.73	-104.89	-13.14	211.29	-190.1
		2.9		0	50.68		0	37.31		0	70.95		0	120.31
	Kanan	6		-95.89	-99.61		-65.69	-60.77		-134.25	-139.46		-220.18	-216.77
62	Kiri	0	-22.64	81.15	-64.83	-9.06	18.35	-20.13	-31.7	113.61	-90.76	-41.67	126.73	-110.01
		2.9		0	53.66		0	10.46		0	75.12		0	80.53
	Kanan	5		-85.58	-78.12		-14.65	-9.06		-119.81	-109.37		-126.14	108.24
63	Kiri	0	-23.42	84.8	-79.92	-9.75	15.19	-10.96	-32.79	118.72	-111.88	-43.7	126.07	113.44
		3.1		0	49.46		0	10.02		0	69.25		0	75.1
	Kanan	6		-81.93	-71.32		-17.8	-18.8		-114.7	-99.85		-126.81	-115.67
64	Kiri	0	-8.71	38.8	-30.1	-3.72	8.25	-5.93	-12.19	54.32	-42.14	-16.41	59.76	-45.62
		1.5		0	-1		0	0.25		0	-1.4		0	-0.8
	Kanan	3		-38.8	-30.1		-8.25	-5.93		-54.32	-42.14		-59.76	-45.62
65	Kiri	0	-23.42	81.93	-71.32	-9.75	17.81	-18.8	-32.79	114.7	-99.85	-43.7	126.81	-115.67
		2.9		0	49.46		0	10.02		0	69.25		0	75.1
	Kanan	6		-84.8	-79.92		-15.19	-10.96		-118.72	-111.88		-126.07	-113.44
66	Kiri	0	-22.64	85.58	-78.12	-9.06	14.65	-9.06	-31.7	119.81	-109.37	-41.67	126.14	-108.24
		3.1		0	53.66		0	10.46		0	75.12		0	80.53
	Kanan	6		-81.15	-64.83		-18.35	-20.13		-113.61	-90.76		-126.73	-110.01

Lampiran 6

Perhitungan Perancangan Kolom Portal Bujur As B = As C
Akibat Beban Gravitasi

	Elemen	2	32
	Satuan		
Pu	N	2066860	250680
M.atas (M1b)	N-mm	2660000	4.87E+06
M.bawah (M2s)	N-mm	2810000	5.52E+06
M _{2s}	N-mm	0	0
d'	mm	40	40
f tul.pokok	mm	22	22
f tul.sengk.	mm	10	10
d	mm	589	589
bl		0.85	0.85

KOLOM

hk	mm	650	650
bk	mm	800	650
Lk	mm	4000	5000

EKSENTRISITAS

e min	mm	34.5	34.5
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KEKAKUAN KOLOM

E _c	MPa	25742.96	25742.96
bd < 1		0.61921708	4.17E-01

INERSIA KOLOM

I _g	mm ⁴	1.8308E+10	1.4876E+10
I _{g.atas}	mm ⁴	1.8308E+10	0
I _{g.bawah}	mm ⁴	0	1.8308E+10

INERSIA BALOK

I _{cr.a.ka}	mm ⁴	5716666667	5716666667
I _{cr.a.ki}	mm ⁴	5716666667	5716666667
I _{cr.b.ka}	mm ⁴	0	5716666667
I _{cr.b.ki}	mm ⁴	0	5716666667

EI kolom

EI	N-mm ²	1.1643E+14	1.0807E+14
EI _{k.atas}	N-mm ²	1.1643E+14	0
EI _{k.bawah}	N-mm ²	0	1.3301E+14

EI balok

EI _{b.a.ka}	N-mm ²	1.4716E+14	1.4716E+14
EI _{b.a.ki}	N-mm ²	1.4716E+14	1.4716E+14
EI _{b.b.ka}	N-mm ²	0	1.4716E+14
EI _{b.a.ki}	N-mm ²	0	1.4716E+14
y _A		1.18673053	0.44060639
y _B		0	1.11846237
y		0.59336526	0.77953438

dipakai k		1.2248359	1.28199727
(k.Lk)/(0,3.hk)		25.1248391	32.8717248
		22<kl/r<100	22<kl/r<100
Pc	N	47823978.6	25932595

Pembesaran momen

SPc	N	259884291	130543980
SP ₁	N	9405320	1131020
db > l		1.07122504	1.0140028
ds > l		1.05896033	1.01253211
Mc	N-mm	3010142.37	5.60E+06
e	mm	1.45638426	2.23E+01

Eksentrisitas balanced=eb

Cb	mm	392.6667	392.6667
ab	mm	333.766667	333.766667
f's	MPa	538.879457	538.879457
		f's > f _y	f's > f _y
dipakai	MPa	f _y	f _y
Cc	N	6808840	5532182.5
Cs	N	1709730	1481766
T's	N	1709730	1481766
Pnb	N	6808840	5532182.5
Mnb	N-mm	2015232855	1688219790
eb	mm	295.973008	305.163431

Penulangan

r total	%	2.40%	2.40%
r=r'		0.012	0.012
As=As'	mm ²	5654.4	4594.2
A ID22	mm ²	379.94	379.94
S tul.perlu	buah	15	13
A perlu	mm ²	5699.1	4939.22
r perlu		0.01209486	0.01290119

Jika eb > e, maka keruntuhan kolom berdasarkan desak

Pn	N	14392046.6	11858078.6
Pr	N	9354830.3	7707751.12
Pr > Pu		OK	OK

Jika eb < e, maka keruntuhan kolom berdasarkan tarik

m		-	-
Pn	N	-	-
Pr	N	-	-
Pr > Pn			

Cek tegangan f's

a	mm	705.492481	715.419526
c	mm	829.991155	841.670031
f's	MPa	571.084029	571.485262
f's > f _y		OK	OK

Lampiran 7

PORTAL MELINTANG UNTUK DAERAH GEMPA 4

C Portal Melintang As.3 - As.6

C Satuan berat KN, satuan panjang m

SYSTEM

L=3

JOINTS

1	Y=0	Z=0
2	Y=8	Z=0
3	Y=11	Z=0
4	Y=19	Z=0
5	Y=0	Z=4
6	Y=8	Z=4
7	Y=11	Z=4
8	Y=19	Z=4
9	Y=0	Z=8
10	Y=8	Z=8
11	Y=11	Z=8
12	Y=19	Z=8
13	Y=0	Z=12
14	Y=8	Z=12
15	Y=11	Z=12
16	Y=19	Z=12
17	Y=0	Z=16
18	Y=8	Z=16
19	Y=11	Z=16
20	Y=19	Z=16
21	Y=0	Z=20
22	Y=8	Z=20
23	Y=11	Z=20
24	Y=19	Z=20
25	Y=0	Z=25
26	Y=8	Z=25
27	Y=11	Z=25
28	Y=19	Z=25

RESTRAINT

1,28,1 R=1,0,0,0,1,1

1,4,1 R=1,1,1,1,1,1



FRAME

NM=4 NL=8

1	$A=0.5200$	$I=2.7733E-2$	$E=2E8$:KOLOM DIMENSI 65/80
2	$A=0.4225$	$I=1.4876E-2$	$E=2E8$:KOLOM DIMENSI 65/65
3	$A=0.2800$	$I=1.1433E-2$	$E=2E8$:BALOK DIMENSI 40/70
4	$A=0.2000$	$I=4.1667E-3$	$E=2E8$:BALOK DIMENSI 40/50
1	$WL=0,-29.8080$:Mati balok elm. 40,42
2	$WL=0,-6.0000$:Hidup balok elm. 40,41,42
3	$WL=0,-27.8880$:Mati balok elm. 41
4	$WL=0,-32.8680$:Mati balok elm. 25,27,28,30,31,33,34,36,37,39
5	$WL=0,-15.0000$:Hidup balok elm.25,27,28,30,31,33,34,36
6	$WL=0,-24.0000$:Hidup alok elm. 37,39
7	$WL=0,-30.9480$:Mati balok elm. 26,29,32,35,38
8	$WL=0,-18.0000$:Hidu balok elm. 26,29,32,38
1,1,5	M=1	LP=3		
2,2,6	M=1			
3,3,7	M=1			
4,4,8	M=1			
5,5,9	M=1			
6,6,10	M=1			
7,7,11	M=1			
8,8,12	M=1			
9,9,13	M=1			
10,10,14	M=1			
11,11,15	M=1			
12,12,16	M=1			
13,13,17	M=1			
14,14,18	M=1			
15,15,19	M=1			
16,16,20	M=1			
17,17,21	M=1			
18,18,22	M=1			
19,19,23	M=1			
20,20,24	M=1			
21,21,25	M=1			
22,22,26	M=2			
23,23,27	M=2			
24,24,28	M=1			
25,5,6	M=3	NSL=4,5		
26,6,7	M=4	NSL=7,8		
27,7,8	M=3	NSL=4,5		
28,9,10	M=3	NSL=4,5		
29,10,11	M=4	NSL=7,8		
30,11,12	M=3	NSL=4,5		
31,13,14	M=3	NSL=4,5		
32,14,15	M=4	NSL=7,8		

di dar
panan

G
Komb.I
KN
7
-1096,52

-1161,35

-1161,35

-1096,52

912,35

-1212,51

-1212,51

912,35

1387,39

974,16

974,16

727,39

512,28

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356,36

168,77

168,77

356,36

139,08

327,33

327,33

139,08

327,33

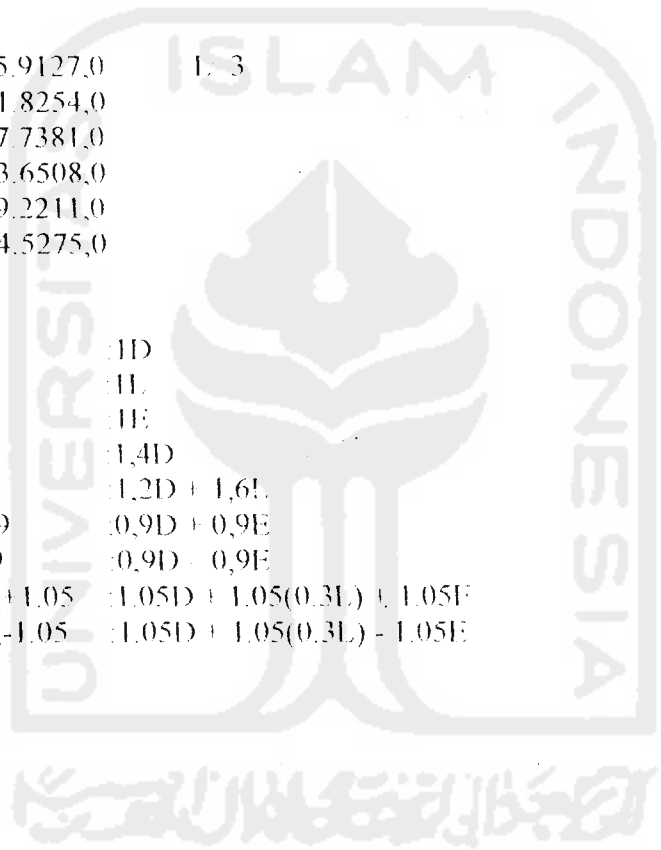
33,15,16	M=3	NSL=4,5
34,17,18	M=3	NSL=4,5
35,18,19	M=4	NSL=7,8
36,19,20	M=3	NSL=4,5
37,21,22	M=3	NSL=4,6
38,22,23	M=4	NSL=7,8
39,23,24	M=3	NSL=4,6
40,25,26	M=3	NSL=1,2
41,26,27	M=4	NSL=3,2
42,27,28	M=3	NSL=1,2

LOADS

5,5,0	F=0,15.9127,0	1, 3
9,9,0	F=0,31.8254,0	
13,13,0	F=0,47.7381,0	
17,17,0	F=0,63.6508,0	
21,21,0	F=0,89.2211,0	
25,25,0	F=0,74.5275,0	

COMBO

1 C=1.0	:1D
2 C=0.0,1.0	:1E
3 C=0.0,0.0, 1.0	:1E
4 C=1.4	:1,4D
5 C=1.2,1.6	:1,2D + 1,6L
6 C=0.9,0.0,+0.9	:0,9D + 0,9E
7 C=0.9,0.0,-0.9	:0,9D - 0,9E
8 C=1.05,0.315,+1.05	:1.05D + 1.05(0.3L) + 1.05E
9 C=1.05,0.315,-1.05	:1.05D + 1.05(0.3L) - 1.05E



1	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	-0.22	0.33	-7.39	-0.31	0.27	-6.85	6.45	-7.89	7.63
	Kanan	3									
27	Kiri	0	16.13	7.31	-11.96	22.58	31.1	3.75	25.28	6.69	31.81
	Kanan	8									
28	Kiri	0	-1.89	-0.7	-24.39	-2.64	-3.38	-23.65	20.25	-27.81	23.41
	Kanan	8									
29	Kiri	0	2.4	0.55	-15.95	3.36	3.76	-12.19	16.52	-14.05	19.41
	Kanan	3									
30	Kiri	0	-1.89	-0.7	-7.54	-2.64	-3.38	-8.48	5.09	-10.12	5.71
	Kanan	8									
31	Kiri	0	0.45	-1.28	-38.78	0.63	-1.51	-31.5	35.3	-40.65	40.79
	Kanan	8									
32	Kiri	0	-0.02	1.77	-23.74	-0.03	2.8	-21.38	21.34	-24.39	25.46
	Kanan	3									
33	Kiri	0	0.45	-1.28	-8.69	0.63	-1.51	-7.42	8.22	-9.05	9.19
	Kanan	8									
34	Kiri	0	-1.67	10.13	-51.92	-2.34	14.2	-48.24	45.23	-53.09	55.96
	Kanan	8									
35	Kiri	0	-2.44	-4.54	-32.63	-3.42	-10.2	-31.56	27.17	-38.25	30.26
	Kanan	3									
36	Kiri	0	-1.67	10.13	-13.1	-2.34	14.2	-13.3	10.29	-12.33	15.19
	Kanan	8									
37	Kiri	0	7.35	-10.69	-73.51	10.29	-8.29	-59.54	72.77	-72.83	81.53
	Kanan	8									
38	Kiri	0	11.86	6.06	-43.31	16.61	23.93	-28.3	49.66	-31.11	59.81
	Kanan	3									
39	Kiri	0	7.35	-10.69	-13.65	10.29	-8.29	-5.66	18.9	-9.98	18.68
	Kanan	8									
40	Kiri	0	-49.23	-17.99	-59.9	-68.92	-87.86	-98.21	9.61	-120.25	5.54
	Kanan	8									
41	Kiri	0	-18.41	-7.72	-37.73	-25.77	-34.44	-50.53	17.39	-61.38	17.86
	Kanan	3									
42	Kiri	0	-19.23	-17.99	-15.39	-68.92	-87.86	-58.15	-30.46	-73.51	-11.2
	Kanan	8									

KETERANGAN :

- 1 Kombinasi 1 (komb 1) = 1,4D
- 2 Kombinasi 2 (komb 2) = 1,2D + 1,6L
- 3 Kombinasi 3 (komb 3) = 0,9D + 0,9L
- 4 Kombinasi 4 (komb 4) = 0,9D + 0,9L
- 5 Kombinasi 5 (komb 5) = 1,05D + 1,05(0,31) + 1,05L
- 6 Kombinasi 6 (komb 6) = 1,05D + 1,05(0,31) + 1,05L

Lampiran 8.b

Gaya Geser (S) yang Terjadi dari SAP90 untuk Portal As 3 = As 6 pada pembebanan Gempa daerah 4

ELM	LETAK		GAYA GESER (S)								
			D	L	E	Komb.1	Komb.2	Komb.3	Komb.4	Komb.5	Komb.6
	m	KN	KN	KN	KN	KN	KN	KN	KN	KN	KN
1	2	3	4	5	6	7	8	9	10	11	12
1	Bawah	0	-28.86	-13.19	71.4	-40.41	-55.74	38.29	-90.24	40.51	-109.43
	Atas	4	-28.86	-13.19	71.4	-40.41	-55.74	38.29	-90.24	40.51	-109.43
2	Bawah	0	22.03	9.64	90.73	30.85	41.87	101.48	-61.82	121.44	-69.09
	Atas	4	22.03	9.64	90.73	30.85	41.87	101.48	-61.82	121.44	-69.09
3	Bawah	0	-22.03	-9.64	90.43	-30.85	-41.87	61.55	-101.21	68.78	-121.12
	Atas	4	-22.03	-9.64	90.43	-30.85	-41.87	61.55	-101.21	68.78	-121.12
4	Bawah	0	28.86	13.19	70.32	40.41	55.74	89.26	-37.31	108.3	-39.37
	Atas	4	28.86	13.19	70.32	40.41	55.74	89.26	-37.31	108.3	-39.37
5	Bawah	0	-44.99	-20.53	58.46	-62.99	-86.84	12.12	-93.1	7.68	-115.09
	Atas	4	-44.99	-20.53	58.46	-62.99	-86.84	12.12	-93.1	7.68	-115.09
6	Bawah	0	38.38	16.65	95.15	53.73	72.7	120.18	-51.09	145.45	-54.36
	Atas	4	38.38	16.65	95.15	53.73	72.7	120.18	-51.09	145.45	-54.36
7	Bawah	0	-38.38	-16.65	95	-53.73	-72.7	50.95	-120.04	54.2	-145.29
	Atas	4	-38.38	-16.65	95	-53.73	-72.7	50.95	-120.04	54.2	-145.29
8	Bawah	0	44.99	20.53	58.36	62.99	86.84	93.01	-12.03	114.98	-7.57
	Atas	4	44.99	20.53	58.36	62.99	86.84	93.01	-12.03	114.98	-7.57
9	Bawah	0	-43.1	-19.83	51.03	-60.34	-83.46	7.13	-84.72	2.07	-105.08
	Atas	4	-43.1	-19.83	51.03	-60.34	-83.46	7.13	-84.72	2.07	-105.08
10	Bawah	0	34.09	15.4	86.71	47.73	65.55	108.72	-47.35	131.69	-50.39
	Atas	4	34.09	15.4	86.71	47.73	65.55	108.72	-47.35	131.69	-50.39
11	Bawah	0	-34.09	-15.4	86.59	-47.73	-65.55	47.24	-108.61	50.27	-131.56
	Atas	4	-34.09	-15.4	86.59	-47.73	-65.55	47.24	-108.61	50.27	-131.56
12	Bawah	0	43.1	19.83	50.82	60.34	83.46	84.53	-6.95	104.87	-1.86
	Atas	4	43.1	19.83	50.82	60.34	83.46	84.53	-6.95	104.87	-1.86
13	Bawah	0	-43.55	-18.55	42.07	-60.97	-81.95	-1.33	-77.06	-7.4	-95.74
	Atas	4	-43.55	-18.55	42.07	-60.97	-81.95	-1.33	-77.06	-7.4	-95.74
14	Bawah	0	34.56	12.36	71.66	48.39	61.24	95.6	-33.39	115.43	-35.06
	Atas	4	34.56	12.36	71.66	48.39	61.24	95.6	-33.39	115.43	-35.06
15	Bawah	0	-34.56	-12.36	71.53	-48.39	-61.24	33.28	-95.49	34.93	-115.29
	Atas	4	-34.56	-12.36	71.53	-48.39	-61.24	33.28	-95.49	34.93	-115.29
16	Bawah	0	43.55	18.55	42.14	60.97	81.95	77.12	1.27	95.81	7.33
	Atas	4	43.55	18.55	42.14	60.97	81.95	77.12	1.27	95.81	7.33
17	Bawah	0	-41.88	-28.69	30.34	-58.63	-96.15	-10.38	-65	-21.15	-84.87
	Atas	4	-41.88	-28.69	30.34	-58.63	-96.15	-10.38	-65	-21.15	-84.87
18	Bawah	0	35.33	27.03	52.36	49.46	85.64	78.92	-15.33	100.59	-9.37
	Atas	4	35.33	27.03	52.36	49.46	85.64	78.92	-15.33	100.59	-9.37
19	Bawah	0	-35.33	-27.03	52.01	-49.46	-85.64	15.01	-78.61	9	-100.22
	Atas	4	-35.33	-27.03	52.01	-49.46	-85.64	15.01	-78.61	9	-100.22
20	Bawah	0	41.88	28.69	29.03	58.63	96.15	63.82	11.56	83.49	22.52
	Atas	4	41.88	28.69	29.03	58.63	96.15	63.82	11.56	83.49	22.52
21	Bawah	0	-49.23	-17.99	14.63	-68.92	-87.86	-31.14	-57.47	-42	-72.71
	Atas	5	-49.23	-17.99	14.63	-68.92	-87.86	-31.14	-57.47	-42	-72.71
22	Bawah	0	30.82	10.28	22.17	43.14	53.42	47.69	7.78	58.87	12.32
	Atas	5	30.82	10.28	22.17	43.14	53.42	47.69	7.78	58.87	12.32
23	Bawah	0	-30.82	-10.28	22.34	-43.14	-53.42	-7.62	-47.84	-12.13	-59.06
	Atas	5	-30.82	-10.28	22.34	-43.14	-53.42	-7.62	-47.84	-12.13	-59.06
24	Bawah	0	49.23	17.99	15.39	68.92	87.86	58.15	30.46	73.51	41.2
	Atas	5	49.23	17.99	15.39	68.92	87.86	58.15	30.46	73.51	41.2
25	Kiri	0	131.55	60.03	-37.95	184.17	253.91	84.24	152.55	117.2	196.88
			0	0		0	0	0	0	0	0
	Kanan	8	-131.39	-59.97	-37.95	-183.93	-253.62	-152.41	-84.1	-196.7	-117.01

1	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	46.42	27	-86.91	64.99	98.91	-36.44	120	-34.01	148.5
			0	0	0	0	0	0	0	-148.5	34.01
	Kanan	3	-46.42	-27	-86.91	-64.99	-98.91	-120	36.44	117.22	196.48
27	Kiri	0	131.39	59.97	-37.74	183.95	253.62	84.28	152.22		
			0	0	0	0	0	0	0	0	0
	Kanan	3	-131.55	-60.03	-37.74	-184.17	-253.91	-152.36	-84.43	-196.67	-117.41
28	Kiri	0	131.97	60.24	-45.34	184.76	254.76	77.97	159.58	109.95	205.15
			0	0	0	0	0	0	0	0	0
	Kanan	8	-130.97	-59.76	-45.34	-183.36	-252.78	-158.68	-77.07	-203.94	-108.74
29	Kiri	0	46.42	27	-101.36	64.99	98.91	-49.44	133	-49.18	163.68
			0	0	0	0	0	0	0	-163.68	49.18
	Kanan	3	-46.42	-27	-101.36	-64.99	-98.91	-133	49.44	108.91	203.77
30	Kiri	0	130.97	59.76	-45.17	183.36	252.78	77.22	158.53		
			0	0	0	0	0	0	0	0	0
	Kanan	8	-131.97	-60.24	-45.17	-184.76	-254.76	-159.43	-78.12	-204.98	-110.12
31	Kiri	0	132.36	60.5	-42.2	185.31	255.64	81.14	157.11	113.73	202.36
			0	0	0	0	0	0	0	0	0
	Kanan	8	-130.58	-59.5	-42.2	-182.81	-251.89	-155.51	-79.54	-200.17	-111.54
32	Kiri	0	46.42	27	-90.92	64.99	98.91	-40.05	123.61	-38.22	152.71
			0	0	0	0	0	0	0	-152.71	38.22
	Kanan	3	-46.42	-27	-90.92	-64.99	-98.91	-123.61	40.05	111.7	200
33	Kiri	0	130.58	59.5	-42.05	182.81	251.89	79.68	155.37		
			0	0	0	0	0	0	0	0	0
	Kanan	8	-132.36	-60.5	-42.05	-185.31	-255.64	-156.97	-81.28	-202.19	-113.89
34	Kiri	0	132.51	60.48	-34.6	185.52	255.78	88.12	150.4	121.86	194.52
			0	0	0	0	0	0	0	0	0
	Kanan	8	-130.43	-59.52	-34.6	-182.6	-251.75	-148.52	-86.25	-192.03	-119.38
35	Kiri	0	46.42	27	-70.68	64.99	98.91	-21.83	105.39	-16.96	131.46
			0	0	0	0	0	0	0	-131.46	16.96
	Kanan	3	-46.42	-27	-70.68	-64.99	-98.91	-105.39	21.83	119.62	191.78
36	Kiri	0	130.43	59.52	-34.36	182.6	251.75	86.46	148.31		
			0	0	0	0	0	0	0	0	0
	Kanan	8	-132.51	-60.48	-34.36	-185.52	-255.78	-150.19	-88.34	-194.27	-122.11
37	Kiri	0	133.34	96.8	-25.43	186.68	314.89	97.12	142.9	143.8	197.21
			0	0	0	0	0	0	0	0	0
	Kanan	8	-129.6	-95.2	-25.43	-181.44	-307.84	-139.53	-93.75	-192.77	-139.37
38	Kiri	0	46.42	27	-47.12	64.99	98.91	-0.63	84.19	7.77	106.73
			0	0	0	0	0	0	0	0	0
	Kanan	3	-46.42	-27	-47.12	-64.99	-98.91	-84.19	0.63	-106.73	-7.77
39	Kiri	0	129.6	95.2	-25.34	181.44	307.84	93.83	139.45	139.46	192.68
			0	0	0	0	0	0	0	0	0
	Kanan	8	-133.34	-96.8	-25.34	-186.68	-314.89	-142.82	-97.2	-197.11	-143.89
40	Kiri	0	121.49	25	-14.23	170.08	185.78	96.53	122.14	120.5	150.37
			0	0	0	0	0	0	0	0	0
	Kanan	8	-116.98	-23	-14.23	-163.77	-177.18	-118.08	-92.48	-145.01	-115.14
41	Kiri	0	41.83	9	-13.63	58.56	64.6	25.39	49.91	32.45	61.07
			0	0	0	0	0	0	0	0	0
	Kanan	3	-41.83	-9	-13.63	-58.56	-64.6	-49.91	-25.39	-61.07	-32.45
42	Kiri	0	116.98	23	-14.37	163.77	177.18	92.35	118.21	114.98	145.16
			0	0	0	0	0	0	0	0	0
	Kanan	8	-121.49	-25	-14.37	-170.08	-185.78	-122.27	-96.4	-150.52	-120.34

KETERANGAN :

1. Kombinasi 1 (komb. 1) = 1,4D
2. Kombinasi 2 (komb. 2) = 1,2D + 1,6I
3. Kombinasi 3 (komb. 3) = 0,9D + 0,9F
4. Kombinasi 4 (komb. 4) = 0,9D + 0,9F
5. Kombinasi 5 (komb. 5) = 1,05D + 1,05(0,3I) + 1,05F
6. Kombinasi 6 (komb. 6) = 1,05D + 1,05(0,3I) + 1,05F

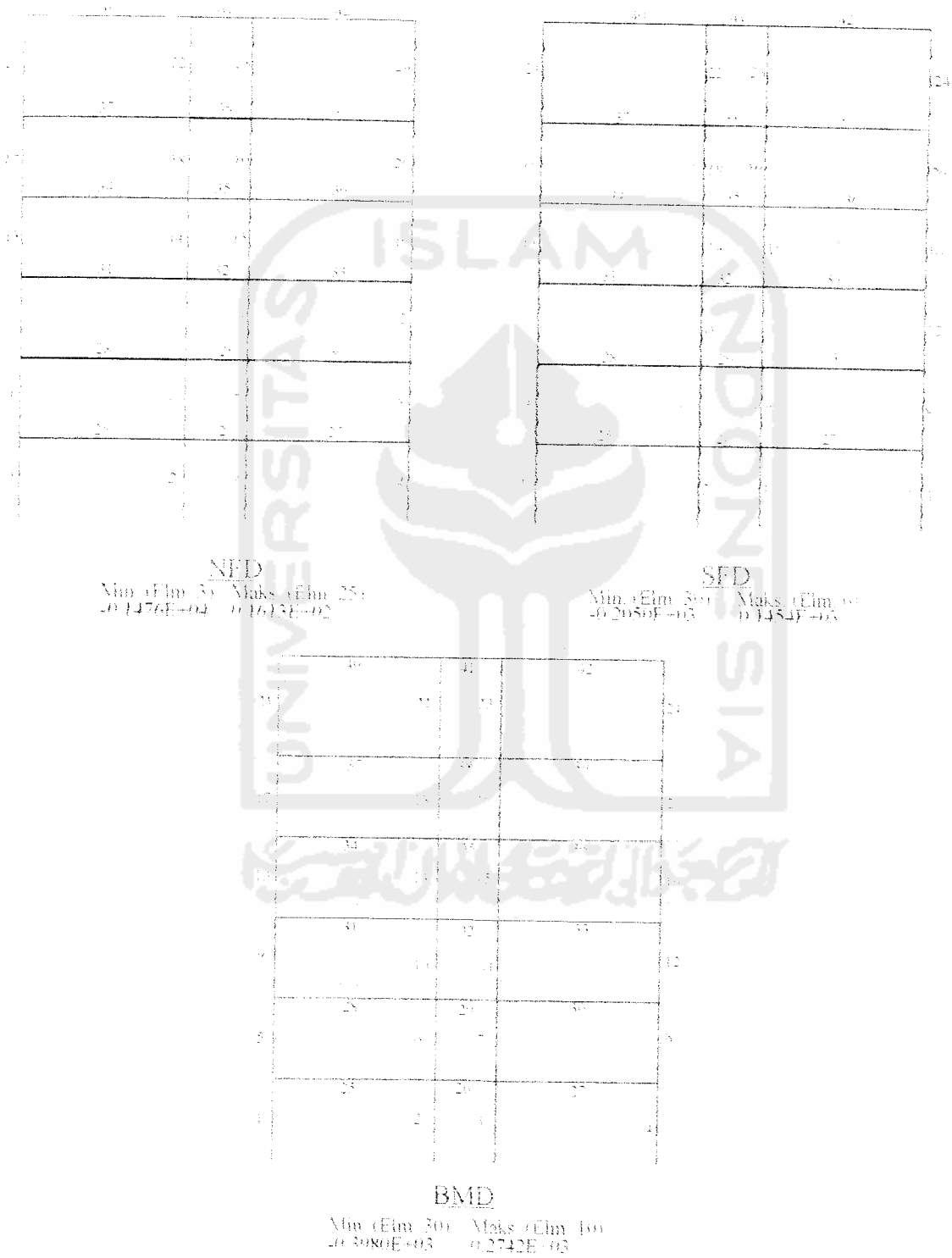
1	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	-29.09	-16.08	130.4	-40.73	-60.64	91.18	-143.55	101.31	-172.54
			5.72	4.17		8.01	13.54				
27	Kanan	3	-29.09	-16.08	-130.33	-40.73	-60.64	-143.48	91.11	-172.46	101.23
	Kiri	0	-168.32	-76.88	148.46	-235.64	-324.98	-17.88	-285.09	-45.07	-356.83
28			94.31	42.99		132.04	181.96	102.2	106.57	130.03	135.13
	Kanan	8	-168.95	-77.15	-153.49	-236.52	-326.17	-290.19	-13.91	-362.86	-40.53
29	Kiri	0	-172.14	-78.68	184.11	-241	-332.47	10.76	-320.63	-12.23	-398.85
		8	92.81	42.29	-178.58	129.94	179.03	113.53	109.81	141.82	137.48
30	Kanan	8	-168.13	-76.75		-235.38	-324.55	-312.04	9.41	-388.22	-13.2
			7.21	4.88		10.09	16.46				
31	Kiri	0	-27.61	-15.37	152.07	-38.65	-57.72	112.02	-161.65	111.96	-193.44
		3	-27.61	-15.37	-152.01	-38.65	-57.72	-161.65	111.96	-193.44	125.78
32	Kanan	3	-168.13	-76.75	178.09	-235.38	-324.55	8.96	-311.59	-13.72	-387.7
			92.81	42.29		129.94	179.03	109.74	113.19	137.44	141.45
33	Kiri	8	-172.14	-78.68	-183.3	-241	-332.47	-319.9	10.04	-398	-13.07
			93.06	42.58		130.28	179.8	109.3	106.98	137.47	134.83
34	Kanan	8	-166.33	-75.42	-166.38	-232.86	-320.27	-299.44	0.05	-373.11	-23.7
	Kiri	0	-27.9	-15.76	136.41	-39.05	-58.68	97.66	-147.87	108.98	-177.48
35			6.92	4.49		9.69	15.5				
	Kanan	3	-27.9	-15.76	-136.34	-39.05	-58.68	-147.82	97.6	-177.42	108.91
36	Kiri	0	-166.33	-75.42	165.91	-232.86	-320.27	-0.38	-299.01	-24.2	-372.61
			93.06	42.58		130.28	179.8	106.93	108.99	134.8	137.13
37	Kanan	8	-173.46	-79.44	-170.48	-242.85	-335.26	-309.55	-2.69	-386.16	-28.16
	Kiri	0	-174.08	-80.46		-243.72	-337.64	-30.42	-282.93	-60.83	-355.43
38			93.04	41.45		130.26	177.98	100.85	99.4	128.41	126.72
	Kanan	8	-165.76	-76.64	-136.48	-232.06	-321.54	-272.02	-26.34	-341.5	-54.88
39	Kiri	0	-27.73	-14.48	106.06	-38.83	-56.44	70.49	-120.41	77.68	-145.04
			7.08	5.77		9.92	17.74				
40	Kanan	3	-27.73	-14.48	-105.97	-38.83	-56.44	-120.34	70.42	-144.95	77.59
	Kiri	0	-165.76	-76.64	135.78	-232.06	-321.54	-26.98	-271.38	-55.62	-340.75
41			93.04	41.45		130.26	177.98	99.38	100.42	126.73	127.94
	Kanan	8	-174.08	-80.46	-139.11	-243.72	-337.64	-281.87	-31.48	-354.2	-62.07
42	Kiri	0	-177.73	-124.56	103.3	-248.82	-412.57	-66.99	-252.92	-117.39	-334.32
			92.75	70.65		129.85	224.33	92.44	92.22	128.35	127.88
43	Kanan	8	-162.77	-118.17	-100.17	-227.87	-384.39	-236.64	-56.34	-313.3	-102.95
	Kiri	0	-28.27	-19.85	70.7	-39.58	-65.69	38.19	-89.08	38.3	-110.18
44			6.54	0.4		9.16	8.49			39.09	39.04
	Kanan	3	-28.27	-19.85	-70.66	-39.58	-65.69	-89.04	38.15	-110.14	38.25
45	Kiri	0	-162.77	-118.17	99.89	-227.87	-384.39	-56.59	-236.39	-103.24	-313.01
			92.75	70.65		129.85	224.33	92.23	92.3	127.9	128.21
46	Kanan	8	-177.73	-124.56	-102.86	-248.82	-412.57	-252.53	-67.38	-333.85	-117.85
	Kiri	0	-149.21	-34.52	60.85	-208.9	-234.29	-79.53	-189.06	-103.66	-231.44
47			98.35	17.54		137.7	146.06	94.16	88.99	115.09	109.22
	Kanan	8	-131.18	-26.55	-52.96	-183.65	-199.9	-165.72	-70.4	-201.71	-90.49
48	Kiri	0	-39.58	-6.03	20.44	-55.41	-57.14	-17.22	-54.01	-21.99	-64.92
			-8.2	0.72		-11.48	-8.69	-4.39	-5.1	-5.1	-5.1
49	Kanan	3	-39.58	-6.03	-20.44	-55.41	-57.14	-54.01	-17.22	-64.92	-21.99
	Kiri	0	-131.18	-26.55	53.35	-183.65	-199.9	-70.04	-166.08	-90.08	-202.12
50			98.35	17.54		137.7	146.06	88.9	94.38	109.1	115.34
	Kanan	8	-149.21	-34.52	-61.61	-208.9	-234.29	-189.74	-78.84	-232.24	-102.85

KETERANGAN :

1. Kombinasi 1 (komb. 1) = 1,1D
2. Kombinasi 2 (komb. 2) = 1,2D + 1,6E
3. Kombinasi 3 (komb. 3) = 0,9D + 0,9E
4. Kombinasi 4 (komb. 4) = 0,9D - 0,9E
5. Kombinasi 5 (komb. 5) = 1,05D + 1,05(0,3L) + 1,05E
6. Kombinasi 6 (komb. 6) = 1,05D + 1,05(0,3L) - 1,05E

Lampiran 9

Diagram BMD, SFD dan NFD untuk Gempa Daerah 4



Lampiran 10.a

Perhitungan Perancangan Kolom Portal Lintang As 3 = As 6
Akibat Beban Gempa Daerah 4

	Elemen	1	2	3	4
	Satuan				
P_u	N	1520800	2054200	2054200	1520800
M.atas (M1b)	N-mm	0	0	0	0
M.bawah (M2b)	N-mm	0	0	0	0
M2s	N-mm	145560000	111660000	111660000	145560000
d'	mm	40	40	40	40
ϕ tul.pokok	mm	22	22	22	22
ϕ tul.sengk.	mm	10	10	10	10
d	mm	739	739	739	739
β_1		0,85	0,85	0,85	0,85

KOLOM

hk	mm	800	800	800	800
bk	mm	650	650	650	650
Lk	mm	4000	4000	4000	4000

EKSENTRISITAS

e min	mm	39	39	39	39
---------	----	----	----	----	----

KEKAKUAN KOLOM

E_c	MPa	25742,96	25742,96	25742,96	25742,96
$\beta_d \leq 1$		0,62143446	0,63138098	0,63138098	0,62143446

INERSIA KOLOM

I_g	mm ⁴	2,7733E+10	2,7733E+10	2,7733E+10	2,7733E+10
$I_{g,atas}$	mm ⁴	2,7733E+10	2,7733E+10	2,7733E+10	2,7733E+10
$I_{g,bawah}$	mm ⁴	0	0	0	0

INERSIA BALOK

$I_{cr,a,ka}$	mm ⁴	5716666667	2083333333	5716666667	0
$I_{cr,a,ki}$	mm ⁴	0	5716666667	2083333333	5716666667
$I_{cr,b,ka}$	mm ⁴	0	0	0	0
$I_{cr,b,ki}$	mm ⁴	0	0	0	0

EI kolom

El	N-mm ²	1,7613E+14	1,7505E+14	1,7505E+14	1,7613E+14
Elk atas	N-mm ²	1,7613E+14	1,7505E+14	1,7505E+14	1,7613E+14
Elk bawah	N-mm ²	0	0	0	0

EI balok

Elb.a.ka	N-mm ²	1,4716E+14	5,3631E+13	1,4716E+14	0
Elb.a.ki	N-mm ²	0	1,4716E+14	5,3631E+13	1,4716E+14
Elb.b.ka	N-mm ²	0	0	0	0
Elb.a.ki	N-mm ²	0	0	0	0
ψ_A		4,78718031	2,41299887	2,41299887	4,78718031
ψ_B		0	0	0	0
ψ		2,39359016	1,20649943	1,20649943	2,39359016

dipakai k		1,65795296	1,39582058	1,39582058	1,65795296
(k.Lk)/(0,3.hk)		27,6325494	23,2636763	23,2636763	27,6325494
		22<kl/r<100	22<kl/r<100	22<kl/r<100	22<kl/r<100
Pc	N	39483536,9	55366270,8	55366270,8	39483536,9

Pembesaran momen

ΣP_c	N	189699615	189699615	189699615	189699615
ΣP_u	N	7150000	7150000	7150000	7150000
$\delta_b > 1$		1,06299004	1,06053538	1,06053538	1,06299004
$\delta_s > 1$		1,06155581	1,06155581	1,06155581	1,06155581
Mc	N-mm	154520064	118533322	118533322	154520064
e	mm	101,604461	57,7029121	57,7029121	101,604461

Eksentrisitas balanced=eb

Cb	mm	492,6667	492,6667	492,6667	492,6667
ab	mm	418,766667	418,766667	418,766667	418,766667
f's	MPa	551,285521	551,285521	551,285521	551,285521
		f's>fy	f's>fy	f's>fy	f's>fy
dipakai	MPa	fy	fy	fy	fy
Cc	N	6941057,5	6941057,5	6941057,5	6941057,5
Cs	N	1823712	1823712	1823712	1823712
Ts	N	1823712	1823712	1823712	1823712
Pnb	N	6941057,5	6941057,5	6941057,5	6941057,5
Mnb	N-mm	2597855932	2597855932	2597855932	2597855932
eb	mm	374,273795	374,273795	374,273795	374,273795

Penulangan

ρ total	%	2,40%	2,40%	2,40%	2,40%
$\rho = \rho'$		0,012	0,012	0,012	0,012
As=As'	mm ²	5764,2	5764,2	5764,2	5764,2
A ID22	mm ²	379,94	379,94	379,94	379,94
Σ tul perlu	buah	16	16	16	16
A perlu	mm ²	6079,04	6079,04	6079,04	6079,04
ρ perlu		0,01265544	0,01265544	0,01265544	0,01265544

Jika eb > e, maka keruntuhan kolom berdasarkan desak

Pn	N	9591063,83	10884296,6	14012389,4	12416960,6
Pr	N	6234191,49	7074792,79	9108053,12	8071024,39
Pr > Pu		OK	OK	OK	OK

Jika eb < e, maka keruntuhan kolom berdasarkan tarik

m		-	-	-	-
Pn	N	-	-	-	-
Pr	N	-	-	-	-
Pr > Pn		-	-	-	-

Cek tegangan f's

a	mm	578,646385	656,669478	845,393027	749,137894
c	mm	680,760453	772,552328	994,580032	881,338699
f's	MPa	564,745308	568,934143	575,869212	572,768698
f's > fy		OK	OK	OK	OK

Lampiran 10.b

Perhitungan Perancangan Kolom Portal Lintang As 3 = As 6
Akibat Beban Gempa Daerah 4

	Elemen Satuan	21	22	23	24
P_u	N	185780	241780	241780	185780
M.atas (M1b)	N-mm	0	0	0	0
M.bawah (M2b)	N-mm	0	0	0	0
M2s	N-mm	234290000	142760000	142760000	234290000
d'	mm	40	40	40	40
ϕ tul.pokok	mm	22	22	22	22
ϕ tul.sengk.	mm	10	10	10	10
d	mm	739	589	589	739
β_1		0,85	0,85	0,85	0,85
KOLOM					
hk	mm	800	650	650	800
bk	mm	650	650	650	650
Lk	mm	5000	5000	5000	5000
EKSENTRISITAS					
e_{min}	mm	39	34,5	34,5	39
KEKAKUAN KOLOM					
E_c	MPa	25742,96	25742,96	25742,96	25742,96
$\beta_1 < 1$		0,76423236	0,76996358	0,76996358	0,76423236
INERSIA KOLOM					
I_g	mm ⁴	2,7733E+10	1,4876E+10	1,4876E+10	2,7733E+10
$I_{g.atas}$	mm ⁴	0	0	0	0
$I_{g.bawah}$	mm ⁴	2,7733E+10	2,7733E+10	2,7733E+10	2,7733E+10
INERSIA BALOK					
$I_{c.a.ka}$	mm ⁴	5716666667	2083333333	5716666667	0
$I_{c.a.ki}$	mm ⁴	0	5716666667	2083333333	5716666667
$I_{c.b.ka}$	mm ⁴	5716666667	2083333333	5716666667	0
$I_{c.b.ki}$	mm ⁴	0	5716666667	2083333333	5716666667
EI kolom					
EI	N-mm ²	1,6187E+14	8,6542E+13	8,6542E+13	1,6187E+14
$E_{k.atas}$	N-mm ²	0	0	0	0
$E_{k.bawah}$	N-mm ²	1,6187E+14	1,6135E+14	1,6135E+14	1,6187E+14
EI balok					
$E_{l.a.ka}$	N-mm ²	1,4716E+14	5,3631E+13	1,4716E+14	0
$E_{l.a.ki}$	N-mm ²	0	1,4716E+14	5,3631E+13	1,4716E+14
$E_{l.b.ka}$	N-mm ²	1,4716E+14	5,3631E+13	1,4716E+14	0
$E_{l.b.ki}$	N-mm ²	0	1,4716E+14	5,3631E+13	1,4716E+14
ψ_A		1,75988136	0,47717566	0,47717566	1,75988136
ψ_B		3,95973306	1,58920997	1,58920997	3,95973306
ψ		2,85980721	1,03319282	1,03319282	2,85980721

dipakai k		1,76817529	1,35223919	1,35223919	1,76817529
(k.Lk)/(0,3.hk)		36,8369851	34,6727996	34,6727996	36,8369851
		22 < kl/r < 100	22 < kl/r < 100	22 < kl/r < 100	22 < kl/r < 100
Pc	N	20418950,5	18665454,9	18665454,9	20418950,5

Pembesaran momen

ΣP_c	N	78168810,8	78168810,8	78168810,8	78168810,8
ΣP_u	N	855120	855120	855120	855120
$\delta_b > 1$		1,01419627	1,02033343	1,02033343	1,01419627
$\delta_s > 1$		1,01711794	1,01711794	1,01711794	1,01711794
Mc	N-mm	238300562	145203757	145203757	238300562
e	mm	1282,70299	600,561491	600,561491	1282,70299

Eksentrisitas balanced=eb

Cb	mm	492,6667	392,6667	392,6667	492,6667
ab	mm	418,766667	333,766667	333,766667	418,766667
fs	MPa	551,285521	538,879457	538,879457	567200
		fs > fy	fs > fy	fs > fy	fs > fy
dipakai	MPa	fy	fy	fy	fy
Cc	N	6941057,5	5532182,5	5532182,5	6941057,5
Cs	N	1823712	1481766	1481766	1823712
Ts	N	1823712	1481766	1481766	1823712
Pnb	N	6941057,5	5532182,5	5532182,5	6941057,5
Mnb	N-mm	2597855932	1688219790	1688219790	2597855932
eb	mm	374,273795	305,163431	305,163431	374,273795

Penulangan

ρ total	%	2,40%	2,40%	2,40%	2,40%
$\rho = \rho'$		0,012	0,012	0,012	0,012
As=As'	mm ²	5764,2	4594,2	4594,2	5764,2
A ID22	mm ²	379,94	379,94	379,94	379,94
Σ tul.perlu	buah	16	13	13	16
A perlu	mm ²	6079,04	4939,22	4939,22	6079,04
ρ perlu		0,01265544	0,01290119	0,01290119	0,01265544

Jika $eb > e$, maka keruntuhan kolom berdasarkan desak

Pn	N	-	-	-	-
Pr	N	-	-	-	-
Pr > Pu		-	-	-	-

Jika $eb < e$, maka keruntuhan kolom berdasarkan tarik

m		11,76471	11,76471	1481766	11,76471
Pn	N	1379168,72	2348392,17	2348392,17	1379168,72
Pr	N	896459,669	1526454,91	1526454,91	896459,669
Pr > Pn		OK	OK	OK	OK

Cek tegangan fs

a	mm	83,207766	141,682785	141,682785	83,207766
c	mm	97,8914894	166,68563	166,68563	97,8914894
fs	MPa	354,830577	456,016382	456,016382	354,830577
fs > fy		OK	OK	OK	OK

Lampiran 11

PERHITUNGAN GAYA GESER DASAR GEMPA YANG TERJADI

PORTAL LINTANG AS 3 =AS 6

PLAT

Beban plat atap (q_a)	=	5,04 KN/m ²
Beban plat lantai 6 (q_{l6})	=	8,55 KN/m ²
Beban plat lantai 2-5 (kantor) (q_{l2-5k})	=	7,05 KN/m ²
Beban plat lantai 2-5 (selasar) (q_{l2-5s})	=	7,55 KN/m ²
Lebar yang ditinjau (l_d)	=	6,00 m

BALOK

Balok Lintang Lt. I-VI

Balok A-B- Balok C-D	$h_{b,AB}$	0,70 m
	$b_{b,AB}$	0,40 m
	$L_{b,AB}$	8,00 m
Balok B-C	$h_{b,BC}$	0,50 m
	$b_{b,BC}$	0,40 m
	$L_{b,BC}$	3,00 m

Balok Bujur Lt. I-VI

Balok L6-A- Balok L6-D	$h_{b,6A}$	0,70 m
	$b_{b,6A}$	0,40 m
	$L_{b,6A}$	6,00 m
Balok L6-B- Balok L6-C	$h_{b,6B}$	0,70 m
	$b_{b,6B}$	0,40 m
	$L_{b,6B}$	6,00 m

KOLOM

Kolom Lt. VI

Kolom L6-A- Kolom L6-D	$h_{k,6A}$	0,80 m
	$b_{k,6A}$	0,65 m
	$L_{k,6A}$	5,00 m
Kolom L6-B- Kolom L6-C	$h_{k,6B}$	0,70 m
	$b_{k,6B}$	0,65 m
	$L_{k,6B}$	5,00 m

Kolom Lt. II = Lt. V

Kolom L5-A- Kolom L5-D	$h_{k,5A}$	0,80 m
	$b_{k,5A}$	0,65 m
	$L_{k,5A}$	4,00 m
Kolom L5-B- Kolom L5-C	$h_{k,5B}$	0,70 m
	$b_{k,5B}$	0,65 m
	$L_{k,5B}$	4,00 m

Tinggi Gedung

Tinggi Total (H) = 25,00 m

Lebar Gedung Arah Lintang

Lebar Total (B) = 19,00 m

Rasio tinggi terhadap lebar gedung

H/B = 1,3 : 3

Berat plat atap	= (5,04)(6)(19)	= 574,56 KN
Berat plat lantai II-V	= 2(7,05.6.8)+(7,55.6.3)	= 812,70 KN
Berat plat lantai VI	= 2(8,55.6.8)+(7,55.6.3)	= 956,70 KN
Berat balok bujur	= (2(0,70.0,40.6) + 2(0,70.0,40.6)).24	= 161,28 KN
Berat balok lintang	= (2(0,70.0,40.8) + (0,50.0,40.3)).24	= 121,92 KN
Berat kolom atap	= (2(0,80.0,65.2,5) + 2(0,70.0,65.2,5)).24	= 117,00 KN
Berat kolom lantai II-V	= 4(0,80.0,65.4).24	= 199,68 KN
Berat kolom lantai VI	= (4(0,80.0,65.2) + 2(0,80.0,65.2,5) + 2(0,70.0,65.2,5)).24	= 216,84 KN
Berat total lantai atap	= 574,56 + 161,28 + 121,92 + 117,0	= 974,76 KN
Berat total lantai II (tipikal)	= 812,70 + 161,28 + 121,92 + 199,68	= 1295,58 KN
Berat total lantai VI	= 956,70 + 161,28 + 121,92 + 216,84	= 1456,74 KN

Berat total Gedung (W)W = W_a + (4.W₁₋₅) + W₆ = 7613,82 KN**Waktu Getar (T)**T = 0.06(H)^{3/4} = 0,67082 Detik

Faktor Keutamaan Gedung (I) = 1,5

Faktor Jenis Struktur (K) = 1

Gaya Geser Dasar Horizontal (V₃)C₃ = 0,0472V₃ = C₃.K.I.W = 539,0585 KN

Lt (l)	wi (KN)	H _i (m)	wi.h _i (KN-m)	F _i (KN)
1	1295,58	4	5182,32	26,522861
2	1295,58	8	10364,64	53,045723
3	1295,58	12	15546,96	79,568584
4	1295,58	16	20729,28	106,09145
5	1456,74	20	29134,8	149,11049
6	974,76	25	24369	124,71936
		Σ	105327	

1	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	-0.22	0.11	-12.12	-0.11	0.26	-11.29	10.89	-11.06	12.9
		1.5									
	Kanan	3									
27	Kiri	0	16.13	7.34	-19.96	22.59	31.11	-3.44	32.48	-1.7	40.21
		4									
	Kanan	8									
28	Kiri	0	-1.91	-0.71	-10.68	-2.67	-3.13	-38.32	31.89	-14.91	40.48
		4									
	Kanan	8									
29	Kiri	0	2.44	0.58	-26.59	3.42	3.86	-21.73	26.13	-25.17	30.66
		1.5									
	Kanan	3									
30	Kiri	0	-1.91	-0.71	-12.54	-2.67	-3.13	-13	9.57	-15.4	40.94
		4									
	Kanan	8									
31	Kiri	0	0.51	1.21	-61.56	0.36	1.29	-57.62	58.6	-67.6	67.98
		4									
	Kanan	8									
32	Kiri	0	-0.22	0.11	-39.56	-0.11	0.26	-35.8	35.41	-41.26	41.81
		1.5									
	Kanan	3									
33	Kiri	0	0.51	1.21	11.55	0.36	1.29	-12.6	13.58	-15.08	15.46
		4									
	Kanan	8									
34	Kiri	0	-1.8	10	-87.11	-2.52	13.83	-89.23	96.97	-99.44	92.95
		4									
	Kanan	8									
35	Kiri	0	-1.01	-3.19	-51.41	-1.42	-6.79	-19.88	18.06	-59.29	51.97
		1.5									
	Kanan	3									
36	Kiri	0	1.8	10	31.09	2.52	13.83	20.6	-17.36	30.89	33.4
		4									
	Kanan	8									
37	Kiri	0	6.9	10.72	-129.81	9.66	8.86	-102.51	114.94	-122.98	130.72
		11									
	Kanan	8									
38	Kiri	0	7.15	3.91	-42.35	10.33	15.19	-38.41	21.82	-66.92	85.02
		1.5									
	Kanan	3									
39	Kiri	0	6.9	10.72	-24.83	9.66	8.86	-16.13	28.56	-22.19	29.91
		3.9									
	Kanan	8									
40	Kiri	0	-48.74	17.89	-101.51	-68.23	-87.11	-135.28	17.52	-163.42	49.81
		4									
	Kanan	8									
41	Kiri	0	-15.28	6.18	68.16	21.89	28.7	30.59	43.09	-81.1	18.23
		1.5									
	Kanan	3									
42	Kiri	0	-48.74	17.89	-21.45	-68.23	-87.11	-65.87	-21.86	-82.18	31.14
		4									
	Kanan	8									

KETERANGAN :

1. Kombinasi 1 (komb. 1) = 1,4D
2. Kombinasi 2 (komb. 2) = 1,3D + 1,64
3. Kombinasi 3 (komb. 3) = 0,9D + 0,9E
4. Kombinasi 4 (komb. 4) = 0,9D + 0,9E
5. Kombinasi 5 (komb. 5) = 1,05D + 1,05(0,3E) + 1,05E
6. Kombinasi 6 (komb. 6) = 1,05D + 1,05(0,3E) + 1,05E

Lampiran 12.b

Gaya Geser (S) yang Terjadi dari SAP90 untuk Portal As 3 = As 6 pada pembebanan Gempa daerah 3

ELM	LETAK		GAYA GESER (S)								
			D	L	E	Komb.1	Komb.2	Komb.3	Komb.4	Komb.5	Komb.6
			KN	KN	KN	KN	KN	KN	KN	KN	KN
	2	3	4	5	6	7	8	9	10	11	12
1	Bawah	0	-28.86	-13.19	119.21	-40.41	-55.74	81.31	-133.27	90.71	-159.64
	Atas	4	-28.86	-13.19	119.21	-40.41	-55.74	81.31	-133.27	90.71	-159.64
2	Bawah	0	22.03	9.64	151.47	-30.84	-41.86	156.15	-116.5	185.21	-132.87
	Atas	4	22.03	9.64	151.47	-30.84	-41.86	156.15	-116.5	185.21	-132.87
3	Bawah	0	-22.03	-9.64	150.97	-30.84	-41.86	116.05	-155.7	132.35	-184.69
	Atas	4	-22.03	-9.64	150.97	-30.84	-41.86	116.05	-155.7	132.35	-184.69
4	Bawah	0	28.86	13.19	117.41	40.41	55.74	131.65	-79.69	157.74	-88.82
	Atas	4	28.86	13.19	117.41	40.41	55.74	131.65	-79.69	157.74	-88.82
5	Bawah	0	-45	-20.54	97.62	-63	-86.86	47.36	-128.36	48.79	-156.22
	Atas	4	-45	-20.54	97.62	-63	-86.86	47.36	-128.36	48.79	-156.22
6	Bawah	0	38.39	16.66	158.85	53.74	72.71	177.51	-108.42	212.35	-121.24
	Atas	4	38.39	16.66	158.85	53.74	72.71	177.51	-108.42	212.35	-121.24
7	Bawah	0	-38.39	-16.66	158.61	-53.74	-72.71	108.2	-177.29	120.99	-212.09
	Atas	4	-38.39	-16.66	158.61	-53.74	-72.71	108.2	-177.29	120.99	-212.09
8	Bawah	0	45	20.54	97.45	63	86.86	128.21	-47.21	156.04	-48.61
	Atas	4	45	20.54	97.45	63	86.86	128.21	-47.21	156.04	-48.61
9	Bawah	0	-43.09	-19.82	85.25	-60.33	-83.43	37.94	-115.51	38.03	-141.01
	Atas	4	-43.09	-19.82	85.25	-60.33	-83.43	37.94	-115.51	38.03	-141.01
10	Bawah	0	34.04	15.36	144.76	47.65	65.43	160.92	-99.65	192.58	-111.42
	Atas	4	34.04	15.36	144.76	47.65	65.43	160.92	-99.65	192.58	-111.42
11	Bawah	0	-34.04	-15.36	144.56	-47.65	-65.43	99.47	-160.74	111.21	-192.37
	Atas	4	-34.04	-15.36	144.56	-47.65	-65.43	99.47	-160.74	111.21	-192.37
12	Bawah	0	43.09	19.82	84.91	60.33	83.43	115.2	-37.64	140.65	-37.67
	Atas	4	43.09	19.82	84.91	60.33	83.43	115.2	-37.64	140.65	-37.67
13	Bawah	0	-43.64	-18.61	70.25	-61.09	-82.14	23.95	-102.49	22.08	-125.44
	Atas	4	-43.64	-18.61	70.25	-61.09	-82.14	23.95	-102.49	22.08	-125.44
14	Bawah	0	34.8	12.55	119.76	48.72	61.83	139.1	-76.46	166.23	-85.26
	Atas	4	34.8	12.55	119.76	48.72	61.83	139.1	-76.46	166.23	-85.26
15	Bawah	0	-34.8	-12.55	119.55	-48.72	-61.83	76.28	-138.91	85.04	-166.02
	Atas	4	-34.8	-12.55	119.55	-48.72	-61.83	76.28	-138.91	85.04	-166.02
16	Bawah	0	43.64	18.61	70.37	61.09	82.14	102.6	-24.06	125.56	-22.21
	Atas	4	43.64	18.61	70.37	61.09	82.14	102.6	-24.06	125.56	-22.21
17	Bawah	0	-41.83	-28.61	51.48	-58.56	-95.97	8.68	-83.98	1.12	-106.99
	Atas	4	-41.83	-28.61	51.48	-58.56	-95.97	8.68	-83.98	1.12	-106.99
18	Bawah	0	34	26.03	86.84	47.61	82.45	108.76	-47.55	135.09	-47.28
	Atas	4	34	26.03	86.84	47.61	82.45	108.76	-47.55	135.09	-47.28
19	Bawah	0	-34	-26.03	86.23	-47.61	-82.45	47	-108.21	46.64	-134.45
	Atas	4	-34	-26.03	86.23	-47.61	-82.45	47	-108.21	46.64	-134.45
20	Bawah	0	41.83	28.61	49.28	58.56	95.97	82	-6.7	104.67	1.2
	Atas	4	41.83	28.61	49.28	58.56	95.97	82	-6.7	104.67	1.2
21	Bawah	0	-48.74	-17.89	23.18	-68.23	-87.11	-23	-64.72	-32.47	-81.15
	Atas	5	-48.74	-17.89	23.18	-68.23	-87.11	-23	-64.72	-32.47	-81.15
22	Bawah	0	33.46	11.41	38.38	46.84	58.41	64.66	-4.43	79.03	-1.57
	Atas	5	33.46	11.41	38.38	46.84	58.41	64.66	-4.43	79.03	-1.57
23	Bawah	0	-33.46	-11.41	38.77	-46.84	-58.41	4.72	-64.95	1.91	-79.37
	Atas	5	-33.46	-11.41	38.77	-46.84	-58.41	4.72	-64.95	1.91	-79.37
24	Bawah	0	48.74	17.89	24.45	68.23	87.11	65.87	21.86	82.48	31.14
	Atas	5	48.74	17.89	24.45	68.23	87.11	65.87	21.86	82.48	31.14
25	Kiri	0	131.53	60.03	-63.17	184.18	233.92	61.37	173.43	90.51	223.58
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-131.39	-59.97	-64.47	-184.95	-233.61	-61.28	-173.28	-90.31	-223.31

1	2	3	4	5	6	7	9	9	10	11	12
26	Kiri	0	46.42	27	-145.06	64.99	98.91	-88.78	172.33	-95.07	209.56
		1.5	0	0	0	0	0	0	0	0	0
	Kanan	3	-46.42	-27	145.06	-64.99	-98.91	88.78	-172.33	95.07	-209.56
27	Kiri	0	131.39	59.97	-63.03	183.95	253.61	61.53	174.98	90.67	223.03
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-131.39	-59.97	63.03	-183.95	-253.61	-61.53	-174.98	-90.67	-223.03
28	Kiri	0	131.98	60.24	-75.72	184.78	251.77	50.64	186.93	78.05	237.06
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-131.98	-60.24	75.72	-184.78	-251.77	-50.64	-186.93	-78.05	-237.06
29	Kiri	0	46.42	27	-169.15	64.99	98.91	-110.45	194.01	-120.36	234.83
		1.5	0	0	0	0	0	0	0	0	0
	Kanan	3	-46.42	-27	169.15	-64.99	-98.91	110.45	-194.01	120.36	-234.83
30	Kiri	0	130.96	59.76	-75.45	183.35	252.76	49.96	185.77	77.11	235.55
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-130.96	-59.76	75.45	-183.35	-252.76	-49.96	-185.77	-77.11	-235.55
31	Kiri	0	132.37	60.5	-70.49	185.32	255.65	55.69	182.58	84.03	212.07
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-132.37	-60.5	70.49	-185.32	-255.65	-55.69	-182.58	-84.03	-212.07
32	Kiri	0	46.42	27	-151.65	64.99	98.91	-94.71	178.27	-101.99	216.48
		1.5	0	0	0	0	0	0	0	0	0
	Kanan	3	-46.42	-27	151.65	-64.99	-98.91	94.71	-178.27	101.99	-216.48
33	Kiri	0	130.57	59.5	-70.23	182.8	251.88	51.31	180.72	82.1	229.59
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-130.57	-59.5	70.23	-182.8	-251.88	-51.31	-180.72	-82.1	-229.59
34	Kiri	0	132.36	60.51	-57.74	185.58	255.88	67.34	171.27	97.62	218.87
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-132.36	-60.51	57.74	-185.58	-255.88	-67.34	-171.27	-97.62	-218.87
35	Kiri	0	46.42	27	-117.54	64.99	98.91	-64	147.56	-66.17	180.66
		1.5	0	0	0	0	0	0	0	0	0
	Kanan	3	-46.42	-27	117.54	-64.99	-98.91	64	-147.56	66.17	-180.66
36	Kiri	0	130.98	59.49	-57.34	182.54	251.65	65.74	168.95	95.44	215.85
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-130.98	-59.49	57.34	-182.54	-251.65	-65.74	-168.95	-95.44	-215.85
37	Kiri	0	133.15	66.66	-42.14	186.41	214.44	81.91	157.76	126.01	214.5
		4.1	0	0	0	0	0	0	0	0	0
	Kanan	8	-133.15	-66.66	42.14	-186.41	-214.44	-81.91	-157.76	-126.01	-214.5
38	Kiri	0	46.42	27	-77.97	64.99	98.91	-28.4	111.96	-24.62	139.12
		1.5	0	0	0	0	0	0	0	0	0
	Kanan	3	-46.42	-27	77.97	-64.99	-98.91	28.4	-111.96	24.62	-139.12
39	Kiri	0	129.79	95.31	-11.99	181.71	308.29	79.02	154.61	122.22	210.41
		3.9	0	0	0	0	0	0	0	0	0
	Kanan	8	-129.79	-95.31	11.99	-181.71	-308.29	-79.02	-154.61	-122.22	-210.41
40	Kiri	0	120.62	24.83	-23.92	168.87	184.48	87.03	130.09	109.35	159.59
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-120.62	-24.83	23.92	-168.87	-184.48	-87.03	-130.09	-109.35	-159.59
41	Kiri	0	41.83	9	-26.32	58.56	61.6	13.96	61.34	19.12	74.4
		1.5	0	0	0	0	0	0	0	0	0
	Kanan	3	-41.83	-9	26.32	-58.56	-61.6	-13.96	-61.34	-19.12	-74.4
42	Kiri	0	117.84	23.17	-24.17	164.98	178.48	84.31	127.81	105.65	156.41
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-117.84	-23.17	24.17	-164.98	-178.48	-84.31	-127.81	-105.65	-156.41

KETERANGAN :

1. Kombinasi 1 (komb 1) 1,1D
2. Kombinasi 2 (komb 2) 1,2D + 1,6I
3. Kombinasi 3 (komb 3) 0,9D + 0,9E
4. Kombinasi 4 (komb 4) 0,9D - 0,9E
5. Kombinasi 5 (komb 5) 1,05D + 1,05(0,3I) + 1,05I
6. Kombinasi 6 (komb 6) 1,05D + 1,05(0,3I) - 1,05E

Lampiran 12.c

Momen (M) yang Terjadi dari SAP90 untuk Portal As 3 = As 6 pada pembebanan Gempa daerah 3

ELM	LETAK			MOMEN (M)							
				D	L	E	Komb.1	Komb.2	Komb.3	Komb.4	Komb.5
	m	KNm	KNm	KNm	KNm	KNm	KNm	KNm	KNm	KNm	KNm
1	Bawah	0	40.08	18.33	-154.22	56.11	77.41	-372.73	444.87	-429.08	524.79
	Atas	4	-75.38	-34.44	22.63	-105.53	-145.56	-47.48	-88.21	-66.24	-115.76
2	Bawah	0	29.38	-12.85	-496.74	-11.13	-55.81	-173.51	420.63	-556.47	486.69
	Atas	4	58.74	25.72	109.13	82.23	111.64	151.08	-45.35	184.36	-44.81
3	Bawah	0	29.38	12.85	-495.44	-11.13	-55.81	-173.51	422.33	-485.31	555.1
	Atas	4	-58.74	-25.72	108.43	82.23	111.64	147.73	-150.46	44.09	-184.64
4	Bawah	0	40.08	18.33	448.71	56.11	77.41	-139.91	367.77	-519	423.29
	Atas	4	-75.38	-34.44	-20.92	-105.53	-145.56	86.67	49.01	111.96	68.03
5	Bawah	0	93.58	42.71	-235.37	131.01	180.63	-127.61	296.05	-135.42	358.85
	Atas	4	-86.41	-39.44	155.12	-120.98	166.8	71.84	-217.38	59.72	-266.04
6	Bawah	0	-80.47	-35.08	-357.45	-112.66	-152.69	-394.15	249.28	-470.87	279.78
	Atas	4	73.07	31.55	277.96	102.3	138.17	315.93	-184.4	378.52	-205.19
7	Bawah	0	80.47	35.08	-357	-112.66	-152.69	-248.87	393.72	-279.3	470.39
	Atas	4	-73.07	-31.55	277.33	-102.3	-138.17	183.92	-315.45	204.64	-377.97
8	Bawah	0	-93.58	-42.71	-235.4	-131.01	-180.63	-296.08	127.63	-358.88	135.45
	Atas	4	86.41	39.44	151.11	120.98	166.8	216.74	-61.2	265.29	-58.98
9	Bawah	0	85.76	39.25	-152.36	120.07	165.72	-59.94	214.31	-57.56	262.39
	Atas	4	-86.61	-40.03	188.65	-121.25	-167.98	91.84	-247.73	94.54	-301.63
10	Bawah	0	-67.41	-29.81	-274.07	-94.37	-128.58	-307.14	186	-367.95	207.61
	Atas	4	68.74	31.65	304.98	96.23	133.12	336.34	-212.62	402.36	-238.08
11	Bawah	0	67.41	29.81	-273.67	94.37	128.58	-185.64	306.98	-207.19	367.53
	Atas	4	-68.74	-31.65	304.58	-96.23	-133.12	212.26	-335.98	237.67	-101.95
12	Bawah	0	-85.76	-39.25	-151.73	-120.07	-165.72	-213.74	59.37	-261.73	56.9
	Atas	4	86.61	40.03	187.92	121.25	167.98	247.07	-91.18	300.86	-93.77
13	Bawah	0	86.9	39.42	-97.37	121.66	167.35	-9.42	165.85	1.42	205.91
	Atas	4	-87.64	-35.02	183.61	-122.69	-161.19	86.38	-244.13	89.74	-295.84
14	Bawah	0	-69.7	-28.05	-200.47	-97.58	-128.52	-243.16	117.7	-292.52	128.48
	Atas	4	69.49	22.13	278.55	97.28	118.8	315.23	-188.16	372.41	-212.55
15	Bawah	0	69.7	28.05	-199.57	97.58	128.52	-117.24	242.7	-127.95	291.99
	Atas	4	-69.49	-22.13	278.24	-97.28	-118.8	187.87	-312.95	212.21	-372.08
16	Bawah	0	-86.9	-39.42	-96.82	-121.66	-167.35	-165.35	8.92	-205.32	-2.01
	Atas	4	87.64	35.02	184.65	122.69	161.19	245.05	-87.31	296.93	-90.83
17	Bawah	0	86.57	45.51	-50.55	121.2	176.7	32.41	123.41	52.15	158.31
	Atas	4	-80.76	-48.92	155.37	-113.06	-207.18	67.15	-212.52	56.63	-269.65
18	Bawah	0	-68.19	-39.79	-125.57	-95.47	-115.49	-174.38	51.64	-215.98	47.71
	Atas	4	67.83	64.33	221.8	94.96	184.32	260.67	-138.58	324.38	-141.41
19	Bawah	0	68.19	39.79	-124.55	95.47	115.49	-50.72	173.46	-46.64	214.91
	Atas	4	-67.83	-64.33	220.38	-94.96	-184.32	137.29	-259.38	139.91	-322.88
20	Bawah	0	-86.57	-45.51	-47.54	-121.2	-176.7	-120.7	-35.12	-155.15	-55.31
	Atas	4	80.76	68.92	139.56	113.06	207.18	207.29	-61.92	263.54	-50.53
21	Bawah	0	96.44	55.3	-15.52	135.02	201.21	72.83	100.77	102.39	134.98
	Atas	5	-147.24	-34.16	100.38	-206.13	-231.34	-12.17	-222.85	-59.96	-270.75
22	Bawah	0	-68.19	-35.11	-61.42	-95.47	-138.01	-116.63	-6.1	-147.15	-18.17
	Atas	5	99.11	21.93	130.5	138.75	154.03	206.64	-28.25	247.99	-26.05
23	Bawah	0	68.19	35.11	-62.34	95.47	138.01	5.27	117.48	17.24	148.14
	Atas	5	-99.11	-21.93	131.2	-138.75	-154.03	28.88	-207.28	26.78	-248.74
24	Bawah	0	-96.44	-55.3	-20.59	-135.02	-204.21	-105.33	-68.27	-140.3	-97.06
	Atas	5	147.24	34.16	101.66	206.13	231.34	221.01	41.02	272.1	58.61
25	Kiri	0	-168.96	-77.15	258	-236.54	-326.19	80.13	-384.26	69.18	-472.61
	Tengah	4	94.31	12.99		132.04	181.96	143.79	135.92	173.58	164.39
	Kanan	8	-168.9	-76.87	-248.93	-235.62	-324.99	-375.51	72.56	-462.31	60.44

1	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	-29.09	-16.08	217.65	-40.73	-60.64	169.7	-222.07	192.92	-264.15
		1.5	5.72	4.17		8.01	13.54				
	Kanan	3	-29.09	-16.08	-217.53	-40.73	60.64	-221.96	169.59	-264.02	192.79
27	Kiri	0	-168.3	-76.87	247.91	-235.62	-324.96	71.65	-374.59	59.37	-461.24
		4	94.31	-42.99		132.04	181.96	135.63	142.91	164.13	172.63
	Kanan	8	-168.96	-77.15	-256.32	-236.54	-326.19	-382.75	78.62	-470.85	67.42
28	Kiri	0	-172.17	-78.69	307.48	-241.04	-332.52	121.78	-431.69	117.29	-528.43
		4	92.81	42.29		129.94	179.04	165.12	158.94	194.92	187.73
	Kanan	8	-168.09	-76.73	-298.26	-235.33	-324.48	-419.72	117.15	-513.84	112.51
29	Kiri	0	-27.61	-15.37	253.77	-38.65	-57.73	203.55	-253.24	232.63	-300.29
		1.5	7.21	4.88		10.09	16.45				
	Kanan	3	27.61	15.37	-253.66	38.65	57.73	-253.15	203.45	-300.18	232.52
30	Kiri	0	-168.09	-76.73	297.44	-235.33	-324.48	116.41	-418.98	111.64	-512.98
		4	92.81	42.29		129.94	179.04	158.61	164.33	187.42	194.08
	Kanan	8	-172.17	-78.69	-306.14	-241.04	-332.52	-430.48	120.57	-527.02	115.88
31	Kiri	0	-173.51	-79.45	286.03	-242.91	-335.33	101.27	-413.58	93.12	-507.51
		4	93.05	42.57		130.27	179.76	153.69	149.86	183.1	178.75
	Kanan	8	-166.31	-75.44	-277.92	-232.83	-320.27	-399.8	100.45	-490.2	93.42
32	Kiri	0	-27.88	-15.74	227.53	-39.03	-58.64	179.69	-229.87	204.68	-273.14
		1.5	6.94	4.51		9.72	15.54				
	Kanan	3	-27.88	-15.74	-227.42	39.03	58.64	-229.77	179.59	-273.02	204.57
33	Kiri	0	-166.31	-75.44	277.13	-232.83	-320.27	99.73	-399.09	92.59	-489.37
		4	93.05	42.57		130.27	179.76	149.58	152.97	178.48	182.33
	Kanan	8	-173.51	-79.45	-284.74	-242.91	-335.33	-412.42	100.1	-506.18	91.76
34	Kiri	0	-174.2	-80.53	234.17	-243.89	-337.89	53.97	-367.54	37.59	-454.16
		4	93.11	41.5		130.35	178.13	130.61	128.26	159.04	156.31
	Kanan	8	-165.51	-76.48	-227.74	-231.71	-320.98	-353.92	56.01	-437	41.25
35	Kiri	0	-27.83	-14.56	176.38	-38.97	-56.69	133.69	-183.79	151.39	-219.01
		1.5	6.98	5.69		9.78	17.49				
	Kanan	3	-27.83	-14.56	-176.23	38.97	56.69	-183.66	133.56	-218.85	151.23
36	Kiri	0	-165.51	-76.48	226.55	-231.71	-320.98	54.94	-352.85	40	-445.75
		4	93.11	41.5		130.35	178.13	127.98	129.64	156.07	158
	Kanan	8	-174.2	-80.53	-232.19	-243.89	-337.89	-365.75	52.19	-452.08	35.52
37	Kiri	0	-177.2	-124.21	170.89	-248.08	-411.38	-5.68	-313.28	-45.75	-404.62
		4.1	92.49	70.45		129.49	223.7	107.72	107.4	142.95	142.2
	Kanan	8	-163.78	-118.91	-166.23	-229.29	-386.8	-297.01	2.2	-383.97	-34.89
38	Kiri	0	-27.76	-19.47	116.99	-38.86	-64.47	80.31	-130.28	87.56	-158.12
		1.5	7.06	0.78		9.88	9.71				
	Kanan	3	-27.76	-19.47	-116.93	38.86	64.47	-130.22	80.25	-158.06	87.49
39	Kiri	0	-163.78	-118.91	163.78	-229.29	-386.8	1.8	-296.61	-35.36	-383.5
		3.9	92.49	70.45		129.49	223.7	107.35	107.42	142.19	142.64
	Kanan	8	-177.2	-124.21	-170.15	-248.08	-411.38	-312.62	-6.35	-403.85	-46.53
40	Kiri	0	-147.24	-34.16	100.38	-206.13	-231.54	-42.17	-222.85	-59.96	-270.75
		4	96.81	17.24		135.54	143.72	98.98	92.56	120.19	112.97
	Kanan	8	-136.13	-27.48	-91.02	-190.58	-207.33	-204.43	-40.6	-247.16	-56.03
41	Kiri	0	-37.02	-5.55	39.48	-51.83	-53.3	2.21	-68.85	0.83	-82.07
		1.5	-5.65	1.2		-7.91	-4.85	6.09	6.11	6.7	6.71
	Kanan	3	-37.02	-5.55	-39.49	51.83	53.3	-68.86	2.23	-82.09	0.85
42	Kiri	0	-136.13	-27.48	91.7	-190.58	-207.33	-39.98	-205.05	-55.3	-247.88
		4	96.81	17.24		135.54	143.72	92.48	99.12	112.87	120.69
	Kanan	8	-147.24	-34.16	-101.66	-206.13	-231.54	-224.01	-11.02	-272.1	-58.61

KETERANGAN :

- 1 Kombinasi 1 (komb 1) = 1.D
- 2 Kombinasi 2 (komb 2) = 1.D + 1.G
- 3 Kombinasi 3 (komb 3) = 0.9D + 0.9G
- 4 Kombinasi 4 (komb 4) = 0.9D + 0.9E
- 5 Kombinasi 5 (komb 5) = 1.05D + 1.05(0.3E) + 1.05E
- 6 Kombinasi 6 (komb 6) = 1.05D + 1.05(0.3E) - 1.05E

Lampiran 13.a

Perhitungan Perancangan Kolom Portal Lintang As 3 = As 6
Akibat Beban Gempa Daerah 3

	Elemen	1	2	3	4
	Satuan				
P_u	N	1285670	882990	881760	1284450
M.atas (M1b)	N-mm	0	0	0	0
M.bawah (M2b)	N-mm	0	0	0	0
M2s	N-mm	524790000	556470000	555100000	519000000
d'	mm	40	40	40	40
ϕ tul.pokok	mm	22	22	22	22
ϕ tul.sengk.	mm	10	10	10	10
d	mm	739	739	739	739
β_1		0.85	0.85	0.85	0.85
KOLOM					
hk	mm	800	800	800	800
bk	mm	650	650	650	650
Lk	mm	4000	4000	4000	4000
EKSENTRISITAS					
e mm	mm	39	39	39	39
KEKAKUAN KOLOM					
E_c	MPa	25742.96	25742.96	25742.96	25742.96
$\beta_d < 1$		0.6214345	0.6313866	0.6313866	0.6214345
INERSIA KOLOM					
I_g	mm ⁴	2.773E+10	2.773E+10	2.773E+10	2.773E+10
$I_{g \text{ atas}}$	mm ⁴	2.773E+10	2.773E+10	2.773E+10	2.773E+10
$I_{g \text{ bawah}}$	mm ⁴	0	0	0	0
INERSIA BALOK					
$I_{c.a.ka}$	mm ⁴	5.717E+09	2.083E+09	5.717E+09	0
$I_{c.a.ki}$	mm ⁴	0	5.717E+09	2.083E+09	5.717E+09
$I_{c.b.ka}$	mm ⁴	0	0	0	0
$I_{c.b.ki}$	mm ⁴	0	0	0	0
EI kolom					
EI	N-mm ²	1.761E+14	1.751E+14	1.751E+14	1.761E+14
EIk atas	N-mm ²	1.761E+14	1.751E+14	1.751E+14	1.761E+14
EIk bawah	N-mm ²	0	0	0	0
EI balok					
EIb.a.ka	N-mm ²	1.472E+14	5.363E+13	1.472E+14	0
EIb.a.ki	N-mm ²	0	1.472E+14	5.363E+13	1.472E+14
EIb.b.ka	N-mm ²	0	0	0	0
EIb.a.ki	N-mm ²	0	0	0	0
ψ_A		4.7871803	2.4129906	2.4129906	4.7871803
ψ_B		0	0	0	0
ψ		2.3935902	1.2064953	1.2064953	2.3935902

dipakai k		1.657953	1.3958196	1.3958196	1.657953
(k.Lk)/(0,3.hk)		27.632549	23.263659	23.263659	27.632549
		22<kl/r<100	22<kl/r<100	22<kl/r<100	22<kl/r<100
Pc	N	39483537	55366160	55366160	39483537

Pembesaran momen

ΣP_c	N	189699393	189699393	189699393	189699393
ΣP_u	N	4334870	4334870	4334870	4334870
$\delta_b > 1$		1.0527376	1.0251528	1.0251169	1.0526849
$\delta_s > 1$		1.0364367	1.0364367	1.0364367	1.0364367
Mc	N-mm	543911640	576745956	575326038	537910671
e	mm	423.05696	653.17383	652.47464	418.78677

Eksentrisitas balanced=eb

Cb	mm	492.6667	492.6667	492.6667	492.6667
ab	mm	418.76667	418.76667	418.76667	418.76667
f's	MPa	551.28552	551.28552	551.28552	551.28552
		f's>fy	f's>fy	f's>fy	f's>fy
dipakai	MPa	fy	fy	fy	fy
Cc	N	6941057.5	6941057.5	6941057.5	6941057.5
Cs	N	1823712	1823712	1823712	1823712
Ts	N	1823712	1823712	1823712	1823712
Pnb	N	6941057.5	6941057.5	6941057.5	6941057.5
Mnb	N-mm	2.598E+09	2.598E+09	2.598E+09	2.598E+09
eb	mm	374.27379	374.27379	374.27379	374.27379

Penulangan

ρ total	%	2.40%	2.40%	2.40%	2.40%
$\rho = \rho'$		0.012	0.012	0.012	0.012
As=As'	mm ²	5764.2	5764.2	5764.2	5764.2
A ID22	mm ²	379.94	379.94	379.94	379.94
Σ tul.perlu	buah	16	16	16	16
A perlu	mm ²	6079.04	6079.04	6079.04	6079.04
ρ perlu		0.0126554	0.0126554	0.0126554	0.0126554

Jika $eb > e$, maka keruntuhan kolom berdasarkan desak

Pn	N	-	-	-	-
Pr	N	-	-	-	-
Pr > Pn					

Jika $eb < e$, maka keruntuhan kolom berdasarkan tarik

m		11.76471	11.76471	11.76471	11.76471
Pn	N	6129731.5	3541098.3	3546408.2	6196739.5
Pr	N	3984325.5	2301713.9	2305165.3	4027880.7
Pr > Pn		OK	OK	OK	OK

Cek tegangan f's

a	mm	369.81789	213.64092	213.96128	373.8606
c	mm	435.07987	251.34226	251.71915	439.83601
f's	MPa	544.83771	504.51267	504.65564	545.43421
f's > fy		OK	OK	OK	OK

Lampiran 13.b

Perhitungan Perancangan Kolom Portal Lintang As 3 = As 6
Akibat Beban Gempa Daerah 3

	Elemen Satuan	21	22	23	24
Pu	N	159590	175270	175530	159850
M.atas (M1b)	N-mm	0	0	0	0
M.bawah (M2b)	N-mm	0	0	0	0
M2s	N-mm	270750000	247990000	248730000	272240000
d'	mm	40	40	40	40
φ tul.pokok	mm	22	22	22	22
φ tul.sengk.	mm	10	10	10	10
d	mm	739	639	639	739
βl		0.85	0.85	0.85	0.85
KOLOM					
hk	mm	800	700	700	800
bk	mm	650	650	650	650
Lk	mm	5000	5000	5000	5000
EKSENTRISITAS					
e mm	mm	39	36	36	39
KEKAKUAN KOLOM					
Ec	MPa	25742.96	25742.96	25742.96	25742.96
βd < 1		0.763759	0.7721353	0.7721353	0.763759
INERSIA KOLOM					
Ig	mm ⁴	2.773E+10	1.858E+10	1.858E+10	2.773E+10
Ig.atas	mm ⁴	0	0	0	0
Ig.bawah	mm ⁴	2.773E+10	2.773E+10	2.773E+10	2.773E+10
INERSIA BALOK					
Icr.a.ka	mm ⁴	5.717E+09	2.083E+09	5.717E+09	0
Icr.a.ki	mm ⁴	0	5.717E+09	2.083E+09	5.717E+09
Icr.b.ka	mm ⁴	5.717E+09	2.083E+09	5.717E+09	0
Icr.b.ki	mm ⁴	0	5.717E+09	2.083E+09	5.717E+09
EI kolom					
EI	N-mm ²	1.619E+14	1.08E+14	1.08E+14	1.619E+14
EIk.atas	N-mm ²	0	0	0	0
EIk.bawah	N-mm ²	1.619E+14	1.611E+14	1.611E+14	1.619E+14
EI balok					
EIb.a.ka	N-mm ²	1.472E+14	5.363E+13	1.472E+14	0
EIb.a.ki	N-mm ²	0	1.472E+14	5.363E+13	1.472E+14
EIb.b.ka	N-mm ²	1.472E+14	5.363E+13	1.472E+14	0
EIb.a.ki	N-mm ²	0	1.472E+14	5.363E+13	1.472E+14
ψA		1.7603537	0.5952505	0.5952505	1.7603537
ψB		3.9607959	1.7059221	1.7059221	3.9607959
ψ		2.8605748	1.1505863	1.1505863	2.8605748

dipakai k		1.7683511	1.3821217	1.3821217	1.7683511
$(k.Lk)/(0,3.hk)$		36.840648	32.90766	32.90766	36.840648
		$22 < kl/r < 100$	$22 < kl/r < 100$	$22 < kl/r < 100$	$22 < kl/r < 100$
P_c	N	20420370	22288177	22288177	20420370

Pembesaran momen

ΣP_c	N	85417093	85417093	85417093	85417093
ΣP_u	N	670240	670240	670240	670240
$\delta_b > 1$		1.0121698	1.0122463	1.0122647	1.0121898
$\delta_s > 1$		1.0122193	1.0122193	1.0122193	1.0122193
M_c	N-mm	274058379	251020268	251769310	275566586
e	mm	1717.2654	1432.1919	1434.3378	1723.9073

Eksentrisitas balanced=eb

C_b	mm	492.6667	426.0000	426.0000	492.6667
ab	mm	418.76667	362.1	362.1	418.76667
f_s	MPa	551.28552	543.66197	543.66197	567200
		$f_s > f_y$	$f_s > f_y$	$f_s > f_y$	$f_s > f_y$
dipakai	MPa	f_y	f_y	f_y	f_y
C_c	N	6941057.5	6001807.5	6001807.5	6941057.5
C_s	N	2279640	2165658	2165658	2279640
T_s	N	2279640	2165658	2165658	2279640
P_{nb}	N	6941057.5	6001807.5	6001807.5	6941057.5
M_{nb}	N-mm	2.917E+09	2.311E+09	2.311E+09	2.917E+09
eb	mm	420.18808	385.08974	385.08974	420.18808

Penulangan

ρ total	%	3.15%	3.45%	3.45%	3.15%
$\rho = \rho'$		0.01575	0.01725	0.01725	0.01575
$A_s = A_s'$	mm ²	7565.5125	7164.7875	7164.7875	7565.5125
A ID22	mm ²	379.94	379.94	379.94	379.94
Σ tul.perlu	buah	20	19	19	20
A perlu	mm ²	7598.8	7218.86	7218.86	7598.8
ρ perlu		0.0158193	0.0173802	0.0173802	0.0158193

Jika $eb > e$, maka keruntuhan kolom berdasarkan desak

P_n	N	-	-	-	-
P_r	N	-	-	-	-
$P_r > P_u$					

Jika $eb < e$, maka keruntuhan kolom be. dasarkan tarik

m		11.76471	11.76471	11.76471	11.76471
P_n	N	1177906.1	1161124.6	1158966.1	1172296.9
P_r	N	765638.93	754730.99	753327.93	761993.01
$P_r > P_n$		OK	OK	OK	OK

Cek tegangan f_s

a	mm	71.065222	70.052767	69.922537	70.726814
c	mm	83.606143	82.41502	82.261808	83.208016
f_s	MPa	312.93975	308.79094	308.24857	311.56625
$f_s > f_y$		OK	OK	OK	OK

Lampiran 14

PERHITUNGAN GAYA GESER DASAR GEMPA YANG TERJADI

PORTAL LINTANG AS 3 = AS 6

PLAT

Beban plat atap (q_a)	5,04 KN/m ²
Beban plat lantai 6 (q_{l6})	8,55 KN/m ²
Beban plat lantai 2-5 (kantor) (q_{l2-5})	7,05 KN/m ²
Beban plat lantai 2-5 (selasar) (q_{l2-5s})	7,55 KN/m ²
Lebar yang ditinjau (L_d)	6,00 m

BALOK

Balok Lintang Lt. I-VI

Balok A-B - Balok C-D	$h_{b,AB}$ 0,70 m
	$b_{b,AB}$ 0,40 m
	$L_{b,AB}$ 8,00 m
Balok B-C	$h_{b,BC}$ 0,50 m
	$b_{b,BC}$ 0,40 m
	$L_{b,BC}$ 3,00 m

Balok Bujur Lt. I-VI

Balok L.6-A - Balok L.6-D	$h_{b,6A}$ 0,70 m
	$b_{b,6A}$ 0,40 m
	$L_{b,6A}$ 6,00 m
Balok L.6-B - Balok L.6-C	$h_{b,6B}$ 0,70 m
	$b_{b,6B}$ 0,40 m
	$L_{b,6B}$ 6,00 m

KOLOM

Kolom Lt. VI

Kolom L.6-A - Kolom L.6-D	$h_{k,6A}$ 0,85 m
	$b_{k,6A}$ 0,65 m
	$L_{k,6A}$ 5,00 m
Kolom L.6-B - Kolom L.6-C	$h_{k,6B}$ 0,85 m
	$b_{k,6B}$ 0,65 m
	$L_{k,6B}$ 5,00 m

Kolom Lt. II = Lt. V

Kolom L.5-A - Kolom L.5-D	$h_{k,5A}$ 0,85 m
	$b_{k,5A}$ 0,65 m
	$L_{k,5A}$ 4,00 m
Kolom L.5-B - Kolom L.5-C	$h_{k,5B}$ 0,85 m
	$b_{k,5B}$ 0,65 m
	$L_{k,5B}$ 4,00 m

Tinggi Gedung

Tinggi Total (H) = 25,00 m

Lebar Gedung Arah Lintang

Lebar Total (B) = 19,00 m

Rasio tinggi terhadap lebar gedung

H/B = 1,3 < 3

Berat plat atap	$(5,04)(6)(19)$	=	574,56 KN
Berat plat lantai II-V	$2(7,05.6.8) + (7,55.6.3)$	=	812,70 KN
Berat plat lantai VI	$2(8,55.6.8) + (7,55.6.3)$	=	956,70 KN
Berat balok bujur	$(2(0,70.0,40.6) + 2(0,70.0,40.6)).24$	=	161,28 KN
Berat balok lintang	$(2(0,70.0,40.8) + (0,50.0,40.3)).24$	=	121,92 KN
Berat kolom atap	$(2(0,85.0,65.2,5) + 2(0,85.0,65.2,5)).24$	=	132,50 KN
Berat kolom lantai II-V	$4(0,85.0,65.4).24$	=	212,16 KN
Berat kolom lantai VI	$(4(0,85.0,65.2) + 2(0,85.0,65.2,5) + 2(0,85.0,65.2,5)).24$	=	238,68 KN
Berat total lantai atap	$574,56 + 161,28 + 121,92 + 132,5$	=	990,36 KN
Berat total lantai II (tipikal)	$812,70 + 161,28 + 121,92 + 212,16$	=	1308,06 KN
Berat total lantai VI	$956,70 + 161,28 + 121,92 + 238,68$	=	1478,58 KN

Berat total Gedung (W)

W = Wa + (4.WI-5) + W6 = 7701,18 KN

Waktu Getar (T)T = 0,06(H)^{3/4} = 0,67082 Detik

Faktor Keutamaan Gedung (I) = 1,5

Faktor Jenis Struktur (K) = 1

Gaya Geser Dasar Horizontal (V₂)C₂ = 0,066V₂ = C₂.K.I.W = 762,4168 KN

Lt. (I)	wi (KN)	hi (m)	wi.hi (KN-m)	Fj (KN)
1	1308,06	4	5232,24	37,403053
2	1308,06	8	10464,48	74,806105
3	1308,06	12	15696,72	112,20916
4	1308,06	16	20928,96	149,61221
5	1478,58	20	29571,6	211,39476
6	990,36	25	24759	176,99153
		Σ	106653	

1	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	-0.77	0.06	-13.16	-1.08	-0.83	-16.14	14.75	-18.81	17.22
	Kanan	3									
27	Kiri	0	15.67	7.14	-27.52	21.94	30.22	-10.66	38.87	-10.19	47.59
	Kanan	8									
28	Kiri	0	-1.7	-0.69	-56.4	-2.38	-3.14	-52.29	49.23	-61.22	57.22
	Kanan	8									
29	Kiri	0	2.76	0.7	-37.47	3.87	1.13	-31.23	36.21	-36.22	42.46
	Kanan	3									
30	Kiri	0	-1.7	-0.69	-18.61	-2.38	-3.11	-18.28	15.22	-21.58	17.51
	Kanan	8									
31	Kiri	0	0.56	0.96	-90.58	0.79	-0.86	81.02	82.03	-94.82	95.4
	Kanan	8									
32	Kiri	0	0.71	1.44	55.76	-1.03	1.42	-50.85	49.52	-58.87	58.23
	Kanan	3									
33	Kiri	0	0.56	-0.96	-20.94	0.79	-0.86	-18.34	19.36	-21.7	22.28
	Kanan	8									
34	Kiri	0	-1.92	-9.54	-124.34	-2.69	12.93	-113.62	110.15	-129.55	131.51
	Kanan	8									
35	Kiri	0	1.71	-1.79	-77.06	2.44	-0.78	67.79	70.92	-79.66	82.18
	Kanan	3									
36	Kiri	0	-1.92	-9.54	-29.07	-2.69	12.93	-27.89	24.43	-29.54	31.5
	Kanan	8									
37	Kiri	0	6.47	-10.57	-166.64	9.06	-9.15	-144.15	153.8	-171.51	178.43
	Kanan	8									
38	Kiri	0	-0.28	0.13	-102.1	-0.39	-0.12	-92.14	91.64	-107.45	106.95
	Kanan	3									
39	Kiri	0	6.47	10.57	39.17	9.06	-9.15	-29.13	41.08	-37.67	44.59
	Kanan	8									
40	Kiri	0	-18.48	-17.89	-147.73	-67.88	-86.81	-176.59	89.32	-211.66	98.57
	Kanan	8									
41	Kiri	0	-9.77	-1.21	-89.82	-13.68	-18.17	-89.63	72.04	-105.89	82.72
	Kanan	3									
42	Kiri	0	-18.48	-17.89	-31.31	-67.88	-86.81	-71.82	-15.45	-89.42	-23.67
	Kanan	8									

KETERANGAN :

1. Kombinasi 1 (komb. 1) = 1.4D
2. Kombinasi 2 (komb. 2) = 1.2D + 1.6I
3. Kombinasi 3 (komb. 3) = 0.9D + 0.9I
4. Kombinasi 4 (komb. 4) = 0.9D + 0.9I'
5. Kombinasi 5 (komb. 5) = 1.05D + 1.05(0.3I) + 1.05I
6. Kombinasi 6 (komb. 6) = 1.05D + 1.05(0.3I) + 1.05I'

Lampiran 15.b

Gaya Geser (S) yang Terjadi dari SAP90 untuk Portal As 3 = As 6 pada pembebanan Gempa daerah 2

ELM	LETAK		GAYA GESER (S)								
			D	L	E	Komb.1	Komb.2	Komb.3	Komb.4	Komb.5	Komb.6
	m	KN	KN	KN	KN	KN	KN	KN	KN	KN	
	2	3	4	5	6	7	8	9	10	11	12
1	Bawah	0	-29.41	-13.44	169.53	-41.17	-86.79	126.11	-179.04	142.9	-213.12
	Atas	4	-29.41	-13.44	169.53	-41.17	-86.79	126.11	-179.04	142.9	-213.12
2	Bawah	0	22.35	9.78	213.52	31.29	-42.46	212.28	-172.05	250.74	-197.65
	Atas	4	22.35	9.78	213.52	31.29	-42.46	212.28	-172.05	250.74	-197.65
3	Bawah	0	-22.35	-9.78	212.74	-31.29	-42.46	171.35	-211.58	196.83	-249.92
	Atas	4	-22.35	-9.78	212.74	-31.29	-42.46	171.35	-211.58	196.83	-249.92
4	Bawah	0	29.41	13.44	166.63	41.17	86.79	176.43	-123.5	210.07	-139.85
	Atas	4	29.41	13.44	166.63	41.17	86.79	176.43	-123.5	210.07	-139.85
5	Bawah	0	-45.07	-20.58	139.35	-63.1	87.01	84.85	-165.98	92.51	-200.13
	Atas	4	-45.07	-20.58	139.35	-63.1	87.01	84.85	-165.98	92.51	-200.13
6	Bawah	0	38.79	16.85	223.45	54.31	73.5	236.02	-166.2	280.67	-188.59
	Atas	4	38.79	16.85	223.45	54.31	73.5	236.02	-166.2	280.67	-188.59
7	Bawah	0	-38.79	-16.85	223.1	-54.31	-73.5	165.87	-235.7	188.21	-280.29
	Atas	4	-38.79	-16.85	223.1	-54.31	-73.5	165.87	-235.7	188.21	-280.29
8	Bawah	0	45.07	20.58	139.11	63.1	87.01	165.77	-84.63	199.88	-92.26
	Atas	4	45.07	20.58	139.11	63.1	87.01	165.77	-84.63	199.88	-92.26
9	Bawah	0	-43.38	-19.89	120.94	-60.73	-83.87	69.81	-147.89	75.18	-178.8
	Atas	4	-43.38	-19.89	120.94	-60.73	-83.87	69.81	-147.89	75.18	-178.8
10	Bawah	0	34.33	15.46	204.52	48.06	65.93	214.97	-153.17	255.66	-173.83
	Atas	4	34.33	15.46	204.52	48.06	65.93	214.97	-153.17	255.66	-173.83
11	Bawah	0	-34.33	-15.46	204.24	-48.06	-65.93	152.92	-214.72	173.54	-255.37
	Atas	4	-34.33	-15.46	204.24	-48.06	-65.93	152.92	-214.72	173.54	-255.37
12	Bawah	0	43.38	19.89	120.5	60.73	83.87	147.48	-69.41	178.33	-74.71
	Atas	4	43.38	19.89	120.5	60.73	83.87	147.48	-69.41	178.33	-74.71
13	Bawah	0	-43.94	-18.93	99.32	-61.52	-83.01	49.84	-128.93	52.18	-156.38
	Atas	4	-43.94	-18.93	99.32	-61.52	-83.01	49.84	-128.93	52.18	-156.38
14	Bawah	0	35.63	13.05	169.7	49.88	63.64	184.8	-120.67	219.71	-136.67
	Atas	4	35.63	13.05	169.7	49.88	63.64	184.8	-120.67	219.71	-136.67
15	Bawah	0	-35.63	-13.05	169.43	-49.88	-63.64	120.42	-184.55	136.38	-219.42
	Atas	4	-35.63	-13.05	169.43	-49.88	-63.64	120.42	-184.55	136.38	-219.42
16	Bawah	0	43.94	18.93	99.55	61.52	83.01	129.14	-50.05	156.63	-52.43
	Atas	4	43.94	18.93	99.55	61.52	83.01	129.14	-50.05	156.63	-52.43
17	Bawah	0	-42.01	-28.46	71.02	-58.82	-95.96	28.8	-104.43	24.64	-130.8
	Atas	4	-42.01	-28.46	71.02	-58.82	-95.96	28.8	-104.43	24.64	-130.8
18	Bawah	0	31.97	24.38	122.45	44.75	77.37	138.98	-81.44	169.82	-87.33
	Atas	4	31.97	24.38	122.45	44.75	77.37	138.98	-81.44	169.82	-87.33
19	Bawah	0	-31.97	-24.38	121.43	-44.75	-77.37	80.52	-138.06	86.25	-168.75
	Atas	4	-31.97	-24.38	121.43	-44.75	-77.37	80.52	-138.06	86.25	-168.75
20	Bawah	0	42.01	28.46	70.49	58.82	95.96	101.25	-25.62	127.09	-20.93
	Atas	4	42.01	28.46	70.49	58.82	95.96	101.25	-25.62	127.09	-20.93
21	Bawah	0	-48.48	-17.89	29.26	-67.88	-86.81	-17.3	-69.97	-25.82	-87.27
	Atas	5	-48.48	-17.89	29.26	-67.88	-86.81	-17.3	-69.97	-25.82	-87.27
22	Bawah	0	38.72	13.68	57.91	54.2	68.35	86.97	-17.28	105.77	-15.85
	Atas	5	38.72	13.68	57.91	54.2	68.35	86.97	-17.28	105.77	-15.85
23	Bawah	0	-38.72	-13.68	58.5	-54.2	-68.35	17.81	-87.5	16.47	-106.39
	Atas	5	-38.72	-13.68	58.5	-54.2	-68.35	17.81	-87.5	16.47	-106.39
24	Bawah	0	48.48	17.89	31.31	67.88	86.81	71.82	15.45	89.42	23.67
	Atas	5	48.48	17.89	31.31	67.88	86.81	71.82	15.45	89.42	23.67
25	Kiri	0	131.61	60.06	85.22	184.26	251.04	41.76	195.15	67.64	246.6
		6.3	0	0		0	0	0	0	0	0
	Kanan	8	-131.33	-59.91	-85.22	-183.86	-253.49	-194.89	-41.5	-246.26	-246.6

1	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	-46.42	27	-196.73	64.99	98.91	-135.27	218.83	-149.31	263.81
			0	0		0	0				
27	Kanan	3	-46.42	-27	-196.73	-64.99	-98.91	-218.83	135.27	-263.81	149.31
	Kiri	0	131.33	59.94	-81.73	183.86	253.49	41.94	194.46	67.8	245.75
28		6.3	0	0		0	0	0	0	0	0
	Kanan	8	-131.61	-60.06	-81.73	-184.26	-251.94	-194.71	-42.19	-246.09	-68.14
29	Kiri	0	132.01	60.26	-104.04	184.81	254.82	25.17	212.44	48.35	266.83
		6.8	0	0		0	0	0	0	0	0
30	Kanan	8	-130.94	-59.74	-104.04	-183.31	-252.71	-211.48	-24.21	-265.54	-47.06
	Kiri	0	46.42	27	-234.27	64.99	98.91	-169.07	252.63	-188.74	303.24
31			0	0		0	0				
	Kanan	3	-46.42	-27	-234.27	-64.99	-98.91	-252.63	169.07	-303.24	188.74
32	Kiri	0	130.94	59.74	-103.65	183.31	252.71	24.56	211.13	47.47	265.13
		6.8	0	0		0	0	0	0	0	0
33	Kanan	8	-132.01	-60.26	-103.65	-184.81	-254.82	-212.09	-25.52	-266.42	-48.76
	Kiri	0	132.38	60.51	-97.97	185.34	255.67	30.98	207.32	55.2	260.93
34		6.7	0	0		0	0	0	0	0	0
	Kanan	8	-130.56	-59.49	-97.97	-182.78	-251.86	-205.67	-29.33	-258.69	-52.96
35	Kiri	0	46.42	27	-212.66	64.99	98.91	-149.61	233.17	-166.04	280.54
			0	0		0	0				
36	Kanan	3	-46.42	-27	-212.66	-64.99	-98.91	-233.17	149.61	-280.54	166.04
	Kiri	0	130.56	59.49	-97.59	182.78	251.86	29.67	205.34	53.36	258.3
37		6.6	0	0		0	0	0	0	0	0
	Kanan	8	-132.38	-60.51	-97.59	-185.34	-255.67	-206.98	-31.31	-260.53	-55.59
38	Kiri	0	132.64	60.55	-80.76	185.69	256.04	46.69	192.05	73.54	243.14
		6.2	0	0		0	0	0	0	0	0
39	Kanan	8	-130.31	-59.45	-80.76	-182.43	-251.49	-189.96	-44.6	-240.35	-70.76
	Kiri	0	46.42	27	-165.78	64.99	98.91	-107.42	190.98	-116.82	231.32
40			0	0		0	0				
	Kanan	3	-46.42	-27	-165.78	-64.99	-98.91	-190.98	107.42	-231.32	116.82
41	Kiri	0	130.31	59.45	-80.18	182.43	251.49	45.11	189.44	71.36	239.74
		6.1	0	0		0	0	0	0	0	0
42	Kanan	8	-132.64	-60.55	-80.18	-185.69	-256.04	-191.54	-47.21	-242.53	-74.15
	Kiri	0	132.78	96.41	-58.88	185.9	313.6	66.51	172.5	107.97	231.62
43		5.5	0	0		0	0	0	0	0	0
	Kanan	8	-130.16	-95.59	-58.88	-182.23	-309.13	-170.14	-64.15	-228.6	-104.95
44	Kiri	0	46.42	27	-110.42	64.99	98.91	-57.6	141.16	-58.7	173.19
			0	0		0	0				
45	Kanan	3	-46.42	-27	-110.42	-64.99	-98.91	-141.16	57.6	-173.19	58.7
	Kiri	0	130.16	95.59	-58.67	182.23	309.13	64.34	169.95	105.17	228.38
46		5.4	0	0		0	0	0	0	0	0
	Kanan	8	-132.78	-96.41	-58.67	-185.9	-313.6	-172.31	-66.7	-231.4	-108.19
47	Kiri	0	119.37	24.59	-35.72	167.11	182.59	75.28	139.58	95.58	170.59
		5.1	0	0		0	0	0	0	0	0
48	Kanan	8	-119.11	-23.41	-35.72	-166.74	-180.37	-139.33	-75.04	-169.93	-94.92
	Kiri	0	41.83	9	-50.46	58.56	64.6	-7.76	83.06	-6.22	99.74
49			0	0		0	0	0	0	0	0
	Kanan	3	-41.83	-9	-50.46	-58.56	-64.6	7.76	-99.74	6.22	
50	Kiri	0	119.1	23.41	-36.09	166.74	180.37	74.71	139.67	94.53	170.32
		5.1	0	0		0	0	0	0	0	0
51	Kanan	8	-119.37	-24.59	-36.09	-167.11	-182.59	-139.91	-74.95	-170.97	-95.19

KETERANGAN :

1. Kombinasi 1 (komb 1) 1.11)
2. Kombinasi 2 (komb 2) 1.11) 1.11)
3. Kombinasi 3 (komb 3) 0.91) 0.91)
4. Kombinasi 4 (komb 4) 0.91) 0.91)
5. Kombinasi 5 (komb 5) 1.051) 1.05(0.31) 1.051)
6. Kombinasi 6 (komb 6) 1.051) 1.05(0.31) 1.051)

Lampiran 15.c

Momen (M) yang Terjadi dari SAP90 untuk Portal As 3 = As 6 pada pembebanan Gempa daerah 2

ELM	LETAK		MOMEN (M)								
			D	L	E	Komb.1	Komb.2	Komb.3	Komb.4	Komb.5	Komb.6
	m	KNm	KNm	KNm	KNm	KNm	KNm	KNm	KNm	KNm	KNm
1	2	3	4	5	6	7	8	9	10	11	12
1	Bawah	0	41.04	18.77	-684.42	57.46	79.29	-579.04	652.92	-669.63	767.65
	Atas	4	-76.58	-35	-6.29	-107.21	-147.89	-74.58	-63.26	-98.03	-84.83
2	Bawah	0	-29.82	-13.03	-742.21	-41.75	-56.64	-694.83	641.15	-814.74	743.9
	Atas	4	59.57	26.07	111.87	83.4	113.2	154.3	-47.06	188.22	-46.7
3	Bawah	0	29.82	13.03	-740.1	-41.75	56.64	-639.25	692.93	-741.68	812.52
	Atas	4	-59.57	-26.07	110.86	-83.4	-113.2	46.15	-153.39	45.63	-187.16
4	Bawah	0	-41.04	-18.77	-675.35	-57.46	-79.29	-644.75	570.87	-758.12	660.1
	Atas	4	76.58	35	-8.84	107.21	147.89	60.97	76.87	82.15	100.71
5	Bawah	0	93.68	42.75	-352.35	131.15	180.81	-232.8	401.43	-258.14	481.8
	Atas	4	-86.62	-39.56	205.06	-121.27	-167.24	106.6	-262.51	111.9	-318.73
6	Bawah	0	-81.36	-35.48	-519.01	-113.91	-154.4	-540.33	393.88	-641.56	448.35
	Atas	4	73.81	31.9	374.81	103.33	139.61	403.76	-270.91	481.1	-306.01
7	Bawah	0	81.36	35.48	-518.36	113.91	154.4	-393.3	539.75	-447.67	640.89
	Atas	4	-73.81	-31.9	374.02	-103.33	-139.61	270.2	-403.05	305.18	-480.27
8	Bawah	0	-93.68	-42.75	-352.5	-131.15	-180.81	-401.56	232.94	-481.95	258.29
	Atas	4	86.62	39.56	203.95	121.27	167.24	261.51	-105.6	317.56	-110.73
9	Bawah	0	86.47	39.54	-216.55	121.05	167.03	-117.07	272.71	-124.13	330.62
	Atas	4	-87.03	-40.01	267.23	-121.85	-168.46	162.17	-318.84	176.6	-384.58
10	Bawah	0	-68.07	-30.05	-387.38	-95.3	-129.77	-409.91	287.38	-487.7	325.81
	Atas	4	69.24	31.78	430.71	96.94	133.95	449.96	-325.32	534.96	-369.53
11	Bawah	0	68.07	30.05	-386.83	95.3	129.77	-286.88	409.41	-325.22	487.11
	Atas	4	-69.24	-31.78	430.15	-96.94	-133.95	324.81	-449.45	368.94	-534.37
12	Bawah	0	-86.47	-39.54	-215.73	-121.05	-167.03	-271.98	116.34	-329.77	123.28
	Atas	4	87.03	40.01	266.25	121.85	168.46	317.96	-161.3	383.56	-175.57
13	Bawah	0	87.41	39.89	-129.46	122.37	168.71	-37.85	195.18	-31.59	240.28
	Atas	4	-88.35	-35.82	267.8	-123.69	-163.32	161.51	-320.54	177.14	-385.24
14	Bawah	0	-70.79	-28.7	-275.41	-99.1	-130.87	-311.58	184.16	-372.55	205.81
	Atas	4	71.73	23.51	403.41	100.42	123.69	427.62	-298.51	506.29	-340.86
15	Bawah	0	70.79	28.7	-274.66	99.1	130.87	-183.49	310.91	-205.03	371.77
	Atas	4	-71.73	-23.51	403.04	-100.42	-123.69	298.18	-427.29	340.47	-505.91
16	Bawah	0	-87.41	-39.89	-128.58	-122.37	-168.71	-194.39	37.05	-239.35	30.66
	Atas	4	88.35	35.82	269.63	123.69	163.32	322.18	-163.15	387.16	-179.07
17	Bawah	0	86.94	45.06	-59.16	121.71	176.42	25	131.49	43.36	167.6
	Atas	4	-81.12	-68.8	236.91	-113.57	-207.43	140.21	-286.23	141.91	-355.61
18	Bawah	0	-66.98	-38.46	-164.47	-93.78	-111.91	-208.31	87.74	-255.15	90.25
	Atas	4	60.89	59.07	325.34	85.24	167.58	347.6	-238	424.14	-259.06
19	Bawah	0	66.98	38.46	-162.88	93.78	111.91	-86.31	206.88	-88.58	253.47
	Atas	4	-60.89	-59.07	322.84	-85.24	-167.58	235.76	-345.35	256.44	-421.52
20	Bawah	0	-86.94	-45.06	-54.48	-121.71	-176.42	-127.27	-29.21	-162.68	-48.27
	Atas	4	81.12	68.8	227.46	113.57	207.43	277.73	-131.71	345.69	-131.99
21	Bawah	0	95.77	55.72	-1.09	134.08	204.08	85.21	87.18	116.97	119.26
	Atas	5	-146.65	-33.75	145.21	-205.31	-229.97	-1.29	-262.67	-12.14	-317.08
22	Bawah	0	-79.28	-44.18	-73.38	-110.99	-165.82	-137.39	-5.3	-174.21	-20.11
	Atas	5	114.3	24.21	216.18	160.02	175.9	297.44	-91.69	354.63	-99.35
23	Bawah	0	79.28	44.18	-75.2	110.99	165.82	3.67	139.03	18.2	176.12
	Atas	5	-114.3	-24.21	217.32	-160.02	-175.9	92.72	-298.46	100.55	-355.83
24	Bawah	0	-95.77	-55.72	-9.48	-134.08	-204.08	-91.73	-77.67	-128.07	-108.16
	Atas	5	146.65	33.75	147.09	205.31	229.97	264.36	40.39	319.05	10.17
25	Kiri	0	-170.26	-77.75	346.06	-238.36	-328.7	158.23	-464.69	160.11	-566.63
		6.3	93.26	42.51		130.56	179.93	187.7	179.03	218.4	208.29
	Kanan	8	-169.12	-77.23	-335.69	-236.76	-326.5	-454.33	149.92	-554.37	150.58

1.	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	-28.18	-15.68	295.18	-39.45	-58.9	240.3	-291.02	275.41	-344.47
			6.64	4.57		9.29	15.28				
	Kanan	3	-28.18	-15.68	-295	-39.45	-58.9	-290.86	240.14	-344.27	275.22
27	Kiri	0	-169.12	-77.23	334.22	-236.76	-326.5	148.59	-453	149.03	-552.83
			6.3	93.26	42.51		130.56	179.93	178.32	186.15	207.62
	Kanan	8	-170.26	-77.75	-343.66	-238.36	-328.7	-462.52	156.06	-564.1	157.58
28	Kiri	0	-173.09	-79.1	421.61	-242.32	-334.26	223.67	-535.23	236.03	-649.35
			6.8	92.01	41.94		128.81	177.5	234.38	227.62	265.82
	Kanan	8	-168.8	-77.04	-410.71	-236.32	-325.81	-521.55	217.72	-632.75	229.74
29	Kiri	0	-26.92	-15.08	351.49	-37.68	-56.43	292.12	-340.57	336.05	-402.08
			7.9	5.17		11.06	17.75				
	Kanan	3	-26.92	-15.08	-351.33	-37.68	-56.43	-340.42	291.97	-401.91	335.88
30	Kiri	0	-168.8	-77.04	409.52	-236.32	-325.81	216.65	-520.48	228.49	-631.5
			6.8	92.01	41.94		128.81	177.5	226.84	232.95	257.2
	Kanan	8	-173.09	-79.1	-419.68	-242.32	-334.26	-533.49	221.94	-647.37	234.01
31	Kiri	0	-174.44	-79.9	396.69	-244.22	-337.17	200.02	-514.02	208.19	-624.86
			6.7	92.16	42.13		129.03	178.01	216.24	212.46	247.02
	Kanan	8	-167.14	-75.85	-387.05	-234	-321.94	-498.77	197.92	-605.8	207.01
32	Kiri	0	-27.11	-15.37	319.07	-37.96	-57.13	262.76	-311.56	301.71	-368.33
			7.7	4.88		10.79	17.05				
	Kanan	3	-27.11	-15.37	-318.91	-37.96	-57.13	-311.42	262.62	-368.16	301.55
33	Kiri	0	-167.14	-75.85	385.9	-234	-321.94	196.88	-497.74	205.8	-604.59
			6.6	92.16	42.13		129.03	178.01	211.76	214.92	242.08
	Kanan	8	-174.44	-79.9	-394.83	-244.22	-337.17	-512.35	198.35	-622.91	206.24
34	Kiri	0	-175.29	-80.87	326.96	-245.4	-339.74	136.51	-452.02	133.79	-552.84
			6.2	92.33	41.34		129.27	176.94	173.36	171.42	202.71
	Kanan	8	-165.98	-76.47	-319.1	-232.37	-321.53	-436.57	137.81	-533.42	136.69
35	Kiri	0	-27.27	-14.5	248.78	-38.18	-55.93	199.36	-248.45	228.02	-294.42
			7.55	5.75		10.57	18.25				
	Kanan	3	-27.27	-14.5	-248.56	-38.18	-55.93	-248.25	199.16	-294.19	227.79
36	Kiri	0	-165.98	-76.47	317.36	-232.37	-321.53	136.24	-435.01	134.86	-531.6
			6.1	92.33	41.34		129.27	176.94	170.64	171.61	199.75
	Kanan	8	-175.29	-80.87	-324.11	-245.4	-339.74	-449.46	133.94	-549.84	130.79
37	Kiri	0	-176.9	-124.52	238.01	-247.66	-411.51	55	-373.41	24.94	-474.87
			5.5	91.31	69.14		127.84	220.2	129.77	129.53	163.48
	Kanan	8	-166.41	-121.2	-233.05	-232.98	-393.62	-359.51	59.97	-457.61	31.78
38	Kiri	0	-26.25	-17.95	165.67	-36.75	-60.21	125.48	-172.73	140.74	-207.17
			8.57	2.3		11.99	13.96				
	Kanan	3	-26.25	-17.95	-165.6	-36.75	-60.21	-172.67	125.42	-207.1	140.67
39	Kiri	0	-166.41	-121.2	232.43	-232.98	-393.62	59.42	-358.96	31.14	-456.97
			5.4	91.31	69.14		127.84	220.2	129.39	129.24	162.6
	Kanan	8	-176.9	-124.52	-236.94	-247.66	-411.51	-372.46	54.04	-473.76	23.83
40	Kiri	0	-146.65	-33.75	145.21	-205.31	-229.97	-1.29	-262.67	-12.14	-317.08
			5.1	92.35	16.66		129.3	137.45	104.34	100.42	125.49
	Kanan	8	-145.57	-28.99	-140.53	-203.8	-221.07	-257.49	-4.53	-309.54	-14.42
41	Kiri	0	-31.27	-4.78	75.65	-43.78	-45.16	39.94	-96.22	45.09	-113.77
			0.11	1.97		0.15	3.28				
	Kanan	3	-31.27	-4.78	-75.72	-43.78	-45.16	-96.29	40	-113.84	45.17
42	Kiri	0	-145.57	-28.99	141.61	-203.8	-221.07	-3.57	-258.46	-13.29	-310.67
			5.1	92.35	16.66		129.3	137.45	100.46	105.1	121.34
	Kanan	8	-146.65	-33.75	-147.09	-205.31	-229.97	-264.36	0.39	-319.05	-10.17

KETERANGAN :

1. Kombinasi 1 (komb. 1) = 1.1D
2. Kombinasi 2 (komb. 2) = 1.1D + 1.6L
3. Kombinasi 3 (komb. 3) = 0.9D + 0.9E
4. Kombinasi 4 (komb. 4) = 0.9D - 0.9E
5. Kombinasi 5 (komb. 5) = 1.05D + 1.05(0.3L) + 1.05E
6. Kombinasi 6 (komb. 6) = 1.05D + 1.05(0.3L) - 1.05E

Lampiran 16.a

Perhitungan Perancangan Kolom Portal Lintang As 3 = As 6
Akibat Beban Gempa Daerah 2

	Elemen	1	2	3	4
	Satuan				
P_u	N	1419700	723540	721790	1417950
M.atas (M1b)	N-mm	0	0	0	0
M.bawah (M2b)	N-mm	0	0	0	0
M2s	N-mm	767650000	814740000	812520000	758120000
d'	mm	40	40	40	40
ϕ tul.pokok	mm	22	22	22	22
ϕ tul.sengk.	mm	10	10	10	10
d	mm	789	789	789	789
β_1		0.85	0.85	0.85	0.85

KOLOM

hk	mm	850	850	850	850
bk	mm	650	650	650	650
Lk	mm	4000	4000	4000	4000

EKSENTRISITAS

e min	mm	40.5	40.5	40.5	40.5
-------	----	------	------	------	------

KEKAKUAN KOLOM

E_c	MPa	25742.96	25742.96	25742.96	25742.96
$\beta_d < 1$		0.62138076	0.6314841	0.6314841	0.62138076

INERSIA KOLOM

I_g	mm ⁴	3.3265E+10	3.3265E+10	3.3265E+10	3.3265E+10
$I_{g.atas}$	mm ⁴	3.3265E+10	3.3265E+10	3.3265E+10	3.3265E+10
$I_{g.bawah}$	mm ⁴	0	0	0	0

INERSIA BALOK

Icr.a.ka	mm ⁴	5716666667	2083333333	5716666667	0
Icr.a.ki	mm ⁴	0	5716666667	2083333333	5716666667
Icr.b.ka	mm ⁴	0	0	0	0
Icr.b.ki	mm ⁴	0	0	0	0

EI kolom

EI	N-mm ²	2.1126E+14	2.0995E+14	2.0995E+14	2.1126E+14
EIk.atas	N-mm ²	2.1126E+14	2.0995E+14	2.0995E+14	2.1126E+14
EIk.bawah	N-mm ²	0	0	0	0

EI balok

EIb.a.ka	N-mm ²	1.4716E+14	5.3631E+13	1.4716E+14	0
EIb.a.ki	N-mm ²	0	1.4716E+14	5.3631E+13	1.4716E+14
EIb.b.ka	N-mm ²	0	0	0	0
EIb.a.ki	N-mm ²	0	0	0	0
ψ_A		5.74223533	2.89411966	2.89411966	5.74223533
ψ_B		0	0	0	0
ψ		2.87111766	1.44705983	1.44705983	2.87111766

Lampiran 16.b

Perhitungan Perancangan Kolom Portal Lintang As 3 = As 6
Akibat Beban Gempa Daerah 2

Elemen		21	22	23	24
Satuan					
P_u	N	170590	163710	164100	170970
M.atas (M1b)	N-mm	0	0	0	0
M.bawah (M2b)	N-mm	0	0	0	0
M2s	N-mm	317080000	354630000	355830000	319050000
d'	mm	40	40	40	40
ϕ tul.pokok	mm	22	22	22	22
ϕ tul.sengk.	mm	10	10	10	10
d	mm	789	789	789	789
β_1		0.85	0.85	0.85	0.85
KOLOM					
hk	mm	850	850	850	850
bk	mm	650	650	650	650
Lk	mm	5000	5000	5000	5000
EKSENTRISITAS					
e mm	mm	40.5	40.5	40.5	40.5
KEKAKUAN KOLOM					
E_c	MPa	25742.96	25742.96	25742.96	25742.96
$\beta_d < 1$		0.76523025	0.77976123	0.77976123	0.76523025
INERSIA KOLOM					
I_g	mm ⁴	3.3265E+10	3.3265E+10	3.3265E+10	3.3265E+10
$I_{g.atas}$	mm ⁴	0	0	0	0
$I_{g.bawah}$	mm ⁴	3.3265E+10	3.3265E+10	3.3265E+10	3.3265E+10
INERSIA BALOK					
$I_{cr.a.ka}$	mm ⁴	5716666667	2083333333	5716666667	0
$I_{cr.a.ki}$	mm ⁴	0	5716666667	2083333333	5716666667
$I_{cr.b.ka}$	mm ⁴	5716666667	2083333333	5716666667	0
$I_{cr.b.ki}$	mm ⁴	0	5716666667	2083333333	5716666667
EI kolom					
EI	N-mm ²	1.9405E+14	1.9246E+14	1.9246E+14	1.9405E+14
$EI_{k.atas}$	N-mm ²	0	0	0	0
$EI_{k.bawah}$	N-mm ²	1.9405E+14	1.9246E+14	1.9246E+14	1.9405E+14
EI balok					
$EI_{b.a.ka}$	N-mm ²	1.4716E+14	5.3631E+13	1.4716E+14	0
$EI_{b.a.ki}$	N-mm ²	0	1.4716E+14	5.3631E+13	1.4716E+14
$EI_{b.b.ka}$	N-mm ²	1.4716E+14	5.3631E+13	1.4716E+14	0
$EI_{b.b.ki}$	N-mm ²	0	1.4716E+14	5.3631E+13	1.4716E+14
ψ_A		2.10971908	1.06120082	1.06120082	2.10971908
ψ_B		4.74686794	2.38770185	2.38770185	4.74686794
ψ		3.42829351	1.72445134	1.72445134	3.42829351

dipakai k		1.89391598	1.508273	1.508273	1.89391598
$(k.Lk)/(0,3.hk)$		37.1356075	29.5739803	29.5739803	37.1356075
		$22 < kl/r < 100$	$22 < kl/r < 100$	$22 < kl/r < 100$	$22 < kl/r < 100$
P_c	N	21335551.3	33366065.3	33366065.3	21335551.3

Pembesaran momen

ΣP_c	N	109403233	109403233	109403233	109403233
ΣP_u	N	669370	669370	669370	669370
$\delta_b > 1$		1.01245408	1.00760585	1.0076241	1.01248217
$\delta_s > 1$		1.00950233	1.00950233	1.00950233	1.00950233
M_c	N-mm	320092998	357999811	359211214	322081718
e	mm	1876.38782	2186.79257	2188.97754	1883.84932

Eksentrisitas balanced=eb

C_b	mm	526.0000	526.0000	526.0000	526.0000
ab	mm	447.1	447.1	447.1	447.1
f'_s	MPa	554.372624	554.372624	554.372624	607200
		$f'_s > f_y$	$f'_s > f_y$	$f'_s > f_y$	$f'_s > f_y$
dipakai	MPa	f_y	f_y	f_y	f_y
C_c	N	7410682.5	7410682.5	7410682.5	7410682.5
C_s	N	2279640	2735568	2735568	2279640
T_s	N	2279640	2735568	2735568	2279640
P_{nb}	N	7410682.5	7410682.5	7410682.5	7410682.5
M_{nb}	N-mm	3200332350	3541822422	3541822422	3200332350
eb	mm	431.853928	477.934714	477.934714	431.853928

Penulangan

ρ total	%	2.90%	3.50%	3.50%	2.90%
$\rho = \rho'$		0.0145	0.0175	0.0175	0.0145
$A_s = A_s'$	mm ²	7436.325	8974.875	8974.875	7436.325
A ID22	mm ²	379.94	379.94	379.94	379.94
Σ tul.perlu	buah	20	24	24	20
A perlu	mm ²	7598.8	9118.56	9118.56	7598.8
ρ perlu		0.01481681	0.01778017	0.01778017	0.01481681

Jika $eb > e$, maka keruntuhan kolom berdasarkan desak

P_n	N	-	-	-	-
P_r	N	-	-	-	-
$P_r > P_n$					

Jika $eb < e$, maka keruntuhan kolom berdasarkan tarik

m		11.76471	11.76471	11.76471	11.76471
P_n	N	1148987.69	1140706.88	1139346.95	1143376.98
P_r	N	746842	741459.47	740575.52	743195.038
$P_r > P_n$		OK	OK	OK	OK

Cek tegangan f'_s

a	mm	69.3205244	68.8209278	68.7388811	68.98202
c	mm	81.5535581	80.9657974	80.8692718	81.1553177
f'_s	MPa	305.714863	303.578538	303.22473	304.270765
$f'_s > f'_t$		OK	OK	OK	OK

Lampiran 17

PERHITUNGAN GAYA GESER DASAR GEMPA YANG TERJADI

PORTAL LINTANG AS 3 = AS 6

PLAT

Beban plat atap (q_a)	5,04 KN/m ²
Beban plat lantai 6 (q_{l6})	8,55 KN/m ²
Beban plat lantai 2-5 (kantor) (q_{l2-5})	7,05 KN/m ²
Beban plat lantai 2-5 (selasar) (q_{l2-5})	7,55 KN/m ²
Lebar yang ditinjau (L)	6,00 m

BALOK

Balok Lintang Lt. I-VI

Balok A-B - Balok C-D	$h_{b,AB}$ 0,70 m
	$b_{b,AB}$ 0,40 m
	$L_{b,AB}$ 8,00 m
Balok B-C	$h_{b,BC}$ 0,50 m
	$b_{b,BC}$ 0,40 m
	$L_{b,BC}$ 3,00 m

Balok Bujur Lt. I-VI

Balok L6-A - Balok L6-D	h_{b6A} 0,70 m
	b_{b6A} 0,40 m
	L_{b6A} 6,00 m
Balok L6-B - Balok L6-C	h_{b6B} 0,70 m
	b_{b6B} 0,40 m
	L_{b6B} 6,00 m

KOLOM

Kolom Lt. VI

Kolom L6-A - Kolom L6-D	h_{k6A} 1,20 m
	b_{k6A} 0,65 m
	L_{k6A} 5,00 m
Kolom L6-B - Kolom L6-C	h_{k6B} 1,20 m
	b_{k6B} 0,60 m
	L_{k6B} 5,00 m

Kolom Lt. II = Lt. V

Kolom L5-A - Kolom L5-D	h_{k5A} 1,20 m
	b_{k5A} 0,65 m
	L_{k5A} 4,00 m
Kolom L5-B - Kolom L5-C	h_{k5B} 1,20 m
	b_{k5B} 0,65 m
	L_{k5B} 4,00 m

Tinggi Gedung

Tinggi Total (H) = 25,00 m

Lebar Gedung Arah Lintang

Lebar Total (B) = 19,00 m

Rasio tinggi terhadap lebar gedung

H/B = 1,3 = 3

Berat plat atap	$(5,04)(6)(19)$	=	574,56 KN
Berat plat lantai II-V	$2(7,05.6.8) + (7,55.6.3)$	=	812,70 KN
Berat plat lantai VI	$2(8,55.6.8) + (7,55.6.3)$	=	956,70 KN
Berat balok bujur	$2(0,70.0,40.6) + 2(0,70.0,40.6).24$	=	161,28 KN
Berat balok lintang	$2(0,70.0,40.8) + (0,50.0,40.3).24$	=	121,92 KN
Berat kolom atap	$2(1,20.0,65.2,5) + 2(1,20.0,60.2,5).24$	=	180,00 KN
Berat kolom lantai II-V	$4(1,20.0,65.4).24$	=	299,52 KN
Berat kolom lantai VI	$(4(1,20.0,65.2) + 2(1,20.0,65.2,5) + 2(1,20.0,60.2,5)).24$	=	329,76 KN
Berat total lantai atap	$574,56 + 161,28 + 121,92 + 180,0$	=	1037,76 KN
Berat total lantai II (tipikal)	$812,70 + 161,28 + 121,92 + 299,52$	=	1395,42 KN
Berat total lantai VI	$956,70 + 161,28 + 121,92 + 329,76$	=	1569,66 KN

Berat total Gedung (W) $W = W_a + (4.W_{I-5}) + W_6 = 8189,10 \text{ KN}$ **Waktu Getar (T)** $T = 0,06(H)^{3/4} = 0,67082 \text{ Detik}$

Faktor Keutamaan Gedung (I) = 1,5

Faktor Jenis Struktur (K) = 1

Gaya Geser Dasar Horizontal (V_1) $C_1 = 0,0849$ $V_1 = C_1.K.I.W = 1042,882 \text{ KN}$

Lt. (l)	w _i (KN)	h _i (m)	w _i .h _i (KN-m)	F _i (KN)
1	1395,42	4	5581,68	51,443457
2	1395,42	8	11163,36	102,88691
3	1395,42	12	16745,04	154,33037
4	1395,42	16	22326,72	205,77383
5	1569,66	20	31393,2	289,33489
6	1037,76	25	25944	239,11243
		Σ	113154	

1	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	-3,75	1,48	-21,35	-0,25	-0,87	15,81	-22,59	18,02	-2,85
		1,5									
	Kanan	3									
27	Kiri	0	12,11	-5,46	11,24	16,95	-23,27	24,17	-2,37	29,91	-1,05
		4									
	Kanan	8									
28	Kiri	0	0,14	-0,13	31,51	-0,03	-0,12	38,53	-38,49	37,88	33,98
		4									
	Kanan	8									
29	Kiri	0	3,53	0,2	-50,78	1,97	-6,17	18,0	-12,51	57,13	19,23
		1,5									
	Kanan	3									
30	Kiri	0	-0,11	-0,15	-70,48	-0,2	-0,12	-63,3	-63,56	-73,8	-71,3
		4									
	Kanan	8									
31	Kiri	0	-0,07	-0,01	31,33	0,1	-0,07	30,83	30,97	35,98	36,13
		4									
	Kanan	8									
32	Kiri	0	0,34	-2,26	-73,31	-1,17	-2,62	-68,82	-70,33	-81,01	-81,31
		1,5									
	Kanan	3									
33	Kiri	0	0,07	-0,01	119,96	0,1	-0,07	107,9	-108,01	123,89	126,01
		4									
	Kanan	8									
34	Kiri	0	-0,38	-0,33	13,92	-0,33	11,91	39,18	-39,38	48,15	-44,09
		4									
	Kanan	8									
35	Kiri	0	3,16	1,13	-107,93	1,13	-25,85	99,97	-91,29	-115,33	-111,3
		1,5									
	Kanan	3									
36	Kiri	0	0,38	-0,33	-130,86	-0,33	11,91	-33,16	-133,85	181,12	-177,05
		4									
	Kanan	8									
37	Kiri	0	3,36	0,16	-69,75	-0,78	8,48	30,59	-19,59	66,51	66,83
		4									
	Kanan	8									
38	Kiri	0	-2,85	1,93	136	3,98	-0,26	119,81	-121,96	140,44	-145,17
		1,5									
	Kanan	3									
39	Kiri	0	3,36	0,16	-211,59	3,78	-8,48	198,13	-188,13	228,17	-222,46
		4									
	Kanan	8									
40	Kiri	0	-19,45	18,11	33,73	-69,31	-88,8	-11,15	-71,87	-22,31	-93,13
		4									
	Kanan	8									
41	Kiri	0	-7,71	-1,21	-122,98	-10,83	-16,93	103,72	-117,65	119,68	138,38
		1,5									
	Kanan	3									
42	Kiri	0	-19,45	18,11	336,93	-69,31	-88,8	-11,15	-231,35	163,55	-256,5
		4									
	Kanan	8									

KEJERANGAN :

1. Kombinasi 1 (komb. 1) = 1,10
2. Kombinasi 2 (komb. 2) = 1,2D + 1,64
3. Kombinasi 3 (komb. 3) = 0,9D + 0,94
4. Kombinasi 4 (komb. 4) = 0,9D + 0,94
5. Kombinasi 5 (komb. 5) = 1,05D + 1,05(0,31) + 1,054
6. Kombinasi 6 (komb. 6) = 1,05D + 1,05(0,31) + 1,054

Lampiran 18.b

Gaya Geser (S) yang Terjadi dari SAP90 untuk Portal As 3 = As 6 pada pembebanan Gempa daerah 1

ELM	LETAK		GAYA GESER (S)								
			D	L	E	Komb.1	Komb.2	Komb.3	Komb.4	Komb.5	Komb.6
	m		KN	KN	KN	KN	KN	KN	KN	KN	KN
I	2	3	4	5	6	7	8	9	10	11	12
1	Bawah	0	-32.39	-14.82	233.34	-45.35	-62.59	180.85	-239.16	206.32	-283.69
	Atas	4	-32.39	-14.82	233.34	-45.35	-62.59	180.85	-239.16	206.32	-283.69
2	Bawah	0	23.93	10.43	283.01	33.5	45.4	276.24	-233.17	325.57	-268.75
	Atas	4	23.93	10.43	283.01	33.5	45.4	276.24	-233.17	325.57	-268.75
3	Bawah	0	-23.93	-10.43	284.91	-33.5	-45.4	234.89	-277.96	270.75	-327.57
	Atas	4	-23.93	-10.43	284.91	-33.5	-45.4	234.89	-277.96	270.75	-327.57
4	Bawah	0	32.39	14.82	241.62	45.35	62.59	246.61	-188.31	292.38	-215.02
	Atas	4	32.39	14.82	241.62	45.35	62.59	246.61	-188.31	292.38	-215.02
5	Bawah	0	-44.5	-20.28	204.15	-62.3	-85.85	143.69	-223.79	161.25	-267.48
	Atas	4	-44.5	-20.28	204.15	-62.3	-85.85	143.69	-223.79	161.25	-267.48
6	Bawah	0	39.79	17.37	290.84	55.7	75.54	297.57	-225.95	352.63	-258.14
	Atas	4	39.79	17.37	290.84	55.7	75.54	297.57	-225.95	352.63	-258.14
7	Bawah	0	-39.79	-17.37	291.52	-55.7	-75.54	226.56	-298.18	258.85	-353.35
	Atas	4	-39.79	-17.37	291.52	-55.7	-75.54	226.56	-298.18	258.85	-353.35
8	Bawah	0	44.5	20.28	204.92	62.3	85.85	224.48	-144.38	268.28	-162.05
	Atas	4	44.5	20.28	204.92	62.3	85.85	224.48	-144.38	268.28	-162.05
9	Bawah	0	-44.36	-20.13	172.65	-62.1	-85.43	115.46	-195.3	128.36	-234.19
	Atas	4	-44.36	-20.13	172.65	-62.1	-85.43	115.46	-195.3	128.36	-234.19
10	Bawah	0	36.09	16.02	271.57	50.53	68.94	276.9	-211.93	328.09	-242.2
	Atas	4	36.09	16.02	271.57	50.53	68.94	276.9	-211.93	328.09	-242.2
11	Bawah	0	-36.09	-16.02	271.82	-50.53	-68.94	212.16	-277.13	242.47	-328.36
	Atas	4	-36.09	-16.02	271.82	-50.53	-68.94	212.16	-277.13	242.47	-328.36
12	Bawah	0	44.36	20.13	172.51	62.1	85.43	195.18	-115.34	234.05	-128.22
	Atas	4	44.36	20.13	172.51	62.1	85.43	195.18	-115.34	234.05	-128.22
13	Bawah	0	-44.28	-20.14	138.31	-62	-85.37	84.63	-164.33	92.39	-198.07
	Atas	4	-44.28	-20.14	138.31	-62	-85.37	84.63	-164.33	92.39	-198.07
14	Bawah	0	36.86	13.77	228.59	51.6	66.26	238.91	-172.56	283.06	-196.99
	Atas	4	36.86	13.77	228.59	51.6	66.26	238.91	-172.56	283.06	-196.99
15	Bawah	0	-36.86	-13.77	229.17	-51.6	-66.26	173.08	-239.42	197.59	-283.66
	Atas	4	-36.86	-13.77	229.17	-51.6	-66.26	173.08	-239.42	197.59	-283.66
16	Bawah	0	44.28	20.14	138.15	62	85.37	164.19	-84.48	197.9	-92.21
	Atas	4	44.28	20.14	138.15	62	85.37	164.19	-84.48	197.9	-92.21
17	Bawah	0	-43.9	-27.87	94.39	-61.46	-97.28	45.44	-124.46	44.23	-153.98
	Atas	4	-43.9	-27.87	94.39	-61.46	-97.28	45.44	-124.46	44.23	-153.98
18	Bawah	0	33.32	25.63	164.59	46.64	80.99	178.12	-118.15	215.88	-129.77
	Atas	4	33.32	25.63	164.59	46.64	80.99	178.12	-118.15	215.88	-129.77
19	Bawah	0	-33.32	-25.63	166.53	-46.64	-80.99	119.9	-179.86	131.81	-217.92
	Atas	4	-33.32	-25.63	166.53	-46.64	-80.99	119.9	-179.86	131.81	-217.92
20	Bawah	0	43.9	27.87	102.93	61.46	97.28	132.15	-53.13	162.95	-53.2
	Atas	4	43.9	27.87	102.93	61.46	97.28	132.15	-53.13	162.95	-53.2
21	Bawah	0	-49.45	-18.41	33.73	-69.24	-88.8	-14.15	-74.87	-22.31	-93.15
	Atas	5	-49.45	-18.41	33.73	-69.24	-88.8	-14.15	-74.87	-22.31	-93.15
22	Bawah	0	41.72	14.2	89.25	58.4	72.77	117.87	-42.78	141.98	-45.43
	Atas	5	41.72	14.2	89.25	58.4	72.77	117.87	-42.78	141.98	-45.43
23	Bawah	0	-41.72	-14.2	87.95	-58.4	-72.77	41.61	-116.7	44.07	-140.62
	Atas	5	-41.72	-14.2	87.95	-58.4	-72.77	41.61	-116.7	44.07	-140.62
24	Bawah	0	49.45	18.41	28.18	69.24	88.8	69.87	19.15	87.32	28.14
	Atas	5	49.45	18.41	28.18	69.24	88.8	69.87	19.15	87.32	28.14
25	Kiri	0	131.73	60.13	-80.24	184.43	254.29	46.35	190.77	73.01	241.51
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-131.21	-59.87	-80.24	-183.69	-253.25	-190.3	-45.88	-240.88	-72.38

1	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	46.42	27	-192.51	64.99	98.91	-131.48	215.04	-144.89	259.38
		1.5	0	0	0	0	0	-215.04			
	Kanan	3	-46.42	-27	-192.51	-64.99	-98.91		131.48	-259.38	144.89
27	Kiri	0	131.21	59.87	-80.94	183.69	253.25	45.25	190.93	71.65	241.61
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-131.73	-60.13	-80.94	-184.43	-254.29	-191.4	-45.72	-242.24	-72.28
28	Kiri	0	131.97	60.26	-110.4	184.76	254.77	19.41	218.14	41.63	273.47
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-130.97	-59.74	-110.4	-183.36	-252.76	-217.24	-18.51	-272.27	-40.42
29	Kiri	0	46.42	27	-258.72	64.99	98.91	-191.07	274.63	-214.41	328.91
		1.5	0	0	0	0	0	-274.63			
	Kanan	3	-46.42	-27	-258.72	-64.99	-98.91		191.07	-328.91	214.41
30	Kiri	0	130.97	59.74	-111	183.36	252.76	17.97	217.78	39.79	272.9
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-131.97	-60.26	-111	-184.76	-254.77	-218.68	-18.87	-274.1	-40.99
31	Kiri	0	132.26	60.44	-112.7	185.17	255.42	17.6	220.47	39.58	276.25
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-130.68	-59.56	-112.7	-182.96	-252.11	-219.05	-16.18	-274.31	-37.64
32	Kiri	0	46.42	27	-257.19	64.99	98.91	-189.69	273.25	-212.8	327.29
		1.5	0	0	0	0	0	-273.25			
	Kanan	3	-46.42	-27	-257.19	-64.99	-98.91		189.69	-327.29	212.8
33	Kiri	0	130.68	59.56	-113.3	182.96	252.11	15.65	219.58	37.01	274.94
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-132.26	-60.44	-113.3	-185.17	-255.42	-221	-17.07	-276.88	-38.95
34	Kiri	0	132.47	60.44	-99.61	185.46	255.68	29.58	208.88	53.54	262.73
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-130.47	-59.56	-99.61	-182.66	-251.85	-207.07	-27.77	-260.35	-51.16
35	Kiri	0	46.42	27	-219.08	64.99	98.91	-155.39	238.95	-172.79	287.28
		1.5	0	0	0	0	0	-238.95			
	Kanan	3	-46.42	-27	-219.08	-64.99	-98.91		155.39	-287.28	172.79
36	Kiri	0	130.47	59.56	-100.39	182.66	251.85	27.07	207.77	50.35	261.16
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-132.47	-60.44	-100.39	-185.46	-255.68	-209.57	-28.88	-263.54	-52.73
37	Kiri	0	132.48	96.42	-80.71	185.47	313.24	46.59	191.86	84.73	254.21
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-130.47	-95.58	-80.71	-182.66	-309.49	-190.06	-44.79	-251.84	-82.36
38	Kiri	0	46.42	27	-168.47	64.99	98.91	-109.85	193.41	-119.65	234.15
		1.5	0	0	0	0	0	-193.41			
	Kanan	3	-46.42	-27	-168.47	-64.99	-98.91		109.85	-234.15	119.65
39	Kiri	0	130.47	95.58	-80.96	182.66	309.49	44.56	190.29	82.09	252.11
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-132.48	-96.42	-80.96	-185.47	-313.24	-192.09	-46.36	-254.48	-84.46
40	Kiri	0	119.82	24.5	-60.38	167.74	182.98	53.49	162.18	70.12	196.93
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-118.65	-23.5	-60.38	-166.11	-179.98	-161.13	-52.44	-195.39	-68.58
41	Kiri	0	41.83	9	-109.38	58.56	64.6	-60.79	136.09	-68.09	161.61
		1.5	0	0	0	0	0	-136.09			
	Kanan	3	-41.83	-9	-109.38	-58.56	-64.6		60.79	-161.61	68.09
42	Kiri	0	118.65	23.5	-59.89	166.11	179.98	52.88	160.68	69.1	194.87
		4	0	0	0	0	0	0	0	0	0
	Kanan	8	-119.82	-23.5	-59.89	-167.74	-182.98	-161.73	-53.93	-196.41	-70.64

KETERANGAN :

- 1 Kombinasi 1 (komb 1) 1,1D
- 2 Kombinasi 2 (komb 2) 1,2D + 1,6L
- 3 Kombinasi 3 (komb 3) 0,9D + 0,9L
- 4 Kombinasi 4 (komb 4) 0,9D + 0,9E
- 5 Kombinasi 5 (komb 5) 1,05D + 1,05(0,3E) + 1,05E
- 6 Kombinasi 6 (komb 6) 1,05D + 1,05(0,3L) + 1,05E

Lampiran 18.c

Momen (M) yang Terjadi dari SAP90 untuk Portal As 3 = As 6
pada pembebanan Gempa daerah I

ELM	LETAK		MOMEN (M)								
			D	L	E	Komb.1	Komb.2	Komb.3	Komb.4	Komb.5	Komb.6
	m	KNm	KNm	KNm	KNm	KNm	KNm	KNm	KNm	KNm	KNm
1	2	3	4	5	6	7	8	9	10	11	12
1	Bawah	0	16,91	21,16	135,215	65,67	90,72	1171,99	1259,12	1361,06	1476,09
	Atas	4	-82,66	37,83	-419,09	-115,73	-159,72	-451,58	302,78	-538,76	341,33
2	Bawah	0	-32,23	-11,01	-1128,13	-45,13	61,11	-1314,6	1256,58	-1538,12	1161,58
	Atas	4	63,18	27,68	296,4	88,87	120,17	-209,63	323,89	-235,81	386,59
3	Bawah	0	-32,23	-11,01	-1434,72	15,13	61,11	-1262,23	1320,26	-1468,18	1514,72
	Atas	4	-63,18	27,68	-295,07	-88,87	-120,17	-322,69	208,43	-385,19	234,44
4	Bawah	0	-16,91	21,16	-1381,92	-65,67	-90,72	-1285,95	1201,51	-1507,03	1395,01
	Atas	4	82,66	-37,83	-415,14	115,73	159,72	-299,5	448,29	-337,5	534,92
5	Bawah	0	91,63	11,77	-711,17	128,29	176,8	581,85	719,79	669,17	887,91
	Atas	4	-86,37	-39,35	75,15	-120,92	-166,61	-10,1	-145,37	-24,18	-182
6	Bawah	0	83,66	-36,57	-904,54	-117,12	-158,9	-889,37	738,79	-1049,12	850,41
	Atas	4	-75,49	32,91	238,83	105,69	113,21	360,89	-165	361,4	-182,14
7	Bawah	0	83,66	-36,57	-905,65	117,12	-158,9	39,3	890,38	-851,58	1050,3
	Atas	4	-75,49	32,91	260,13	-105,69	-113,21	-166,41	-302,33	183,82	-363,09
8	Bawah	0	-91,63	11,77	-711,24	-128,29	-176,8	719,59	584,65	-887,68	668,93
	Atas	4	86,37	-39,35	78,11	120,92	166,61	118,33	7,14	185,15	20,72
9	Bawah	0	-89,28	10,94	-368,52	121,99	-122,63	251,32	112,01	-280,31	193,58
	Atas	4	-88,15	39,57	322,07	-123,12	169,1	-210,52	-369,2	233,14	-113,2
10	Bawah	0	-71,6	-31,25	-568,68	100,23	-133,91	-576,25	417,37	-682,13	512,09
	Atas	4	72,78	32,83	517,6	-101,9	139,86	531,35	-400,34	630,25	-456,72
11	Bawah	0	-71,6	-31,25	-569,2	100,23	135,91	-417,85	576,72	-512,64	682,68
	Atas	4	72,78	32,83	518,09	-101,9	-139,86	400,78	-531,78	457,23	-630,76
12	Bawah	0	-89,28	10,94	-368,18	-124,99	-172,63	411,71	251,01	-493,22	279,95
	Atas	4	88,15	-39,57	321,88	123,12	169,1	-369,03	-210,35	343	-232,91
13	Bawah	0	88,66	11,16	-130,66	121,13	172,73	-37,79	197,59	-31,03	243,31
	Atas	4	-88,47	-39,11	422,59	-123,85	-168,73	390,71	-159,95	338,51	-548,93
14	Bawah	0	73,06	10,18	-316,91	-102,29	-156,15	351	219,48	-119,1	216,46
	Atas	4	-74,37	-21,59	397,15	104,11	128,38	-604,63	-170,77	713,15	-541,49
15	Bawah	0	73,06	10,18	-318,26	102,29	136,15	-220,95	352,46	-248,17	420,81
	Atas	4	-74,37	-21,59	398,11	-104,11	-128,38	605,37	-171,37	605,23	-512,18
16	Bawah	0	88,66	11,16	-133,77	121,13	-172,73	37,79	200,19	40,6	-246,61
	Atas	4	-88,47	-39,11	418,82	-123,85	168,73	-356,56	-297,32	544,97	-334,55
17	Bawah	0	89,17	12,18	22,58	154,83	151,19	106,57	59,95	130,62	83,21
	Atas	4	-86,43	-30,31	100,13	-121	-211,62	282,33	-137,9	307,55	-332,72
18	Bawah	0	-70,52	39,31	-127,9	98,73	117,52	-178,58	51,64	-220,72	17,86
	Atas	4	62,74	-63,21	530,48	-87,84	-176,43	533,9	-420,97	642,8	-471,21
19	Bawah	0	70,52	39,31	-129,91	98,73	117,52	-53,18	180,11	-50,01	222,87
	Atas	4	-62,74	-63,21	536,2	-87,84	-176,43	426,11	-539,1	477,22	-418,8
20	Bawah	0	39,13	12,18	11,99	-121,83	151,19	66,76	-93,74	-91,17	-122,63
	Atas	4	-86,43	-69,31	-126,71	121	-214,62	461,82	-306,25	560,63	-335,46
21	Bawah	0	91,53	38,31	76,56	128,17	203,11	181,1	116,65	194,65	31,3
	Atas	5	-155,71	33,71	215,03	-218,01	-216,88	80,36	-360,7	83,13	-431,34
22	Bawah	0	-82,92	-15,82	-11,03	116,09	172,82	-111,27	-31,99	-147,75	-55,25
	Atas	5	125,66	25,16	102,19	-175,93	-191,05	-175,07	218,87	562,17	-282,32
23	Bawah	0	82,92	15,82	9,21	-116,09	-172,82	111,27	31,99	109,92	60,33
	Atas	5	-125,66	-25,16	-100,51	175,93	191,05	175,07	-218,87	-560,63	335,46
24	Bawah	0	91,53	38,31	191,66	128,17	-203,11	9,12	-175,57	-7,73	-221,22
	Atas	5	-155,71	33,71	-212,87	-218,01	-216,88	358,17	-98,14	428,85	-80,53
25	Kiri	0	-174,3	-79,6	322,38	211,02	336,52	133,27	-447,01	130,41	-516,58
		4	89,3	10,92		125,57	175,1	169,58	168,16	198,34	196,7
	Kanan	8	-172,2	-78,57	-319,52	-211,08	-332,35	-142,55	132,59	-541,96	129,94

1	2	3	4	5	6	7	8	9	10	11	12
26	Kiri	0	-25.07	-14.31	288.62	-35.09	-52.97	237.2	-282.31	272.22	-333.88
		1.5	9.75	5.94		13.65	21.2	-282.58			
	Kanan	3	-25.07	-14.31	-288.91	-35.09	-52.97		237.46	-334.18	272.53
27	Kiri	0	-172.2	-78.57	321.68	-241.08	-332.35	134.53	-444.49	132.2	-543.32
		4	89.7	40.92		125.57	173.1	169.13	171.69	197.62	200.58
	Kanan	8	-174.3	-79.6	-325.8	-244.02	-336.52	-450.09	136.36	-550.18	134.01
28	Kiri	0	-175.65	-80.29	443.67	-245.91	-339.25	241.22	-557.39	256.13	-675.58
		4	89.29	40.73		125	172.32	247.58	246.89	278.21	277.45
	Kanan	8	-171.67	-78.24	-439.56	-240.34	-331.2	-550.1	241.1	-666.44	256.63
29	Kiri	0	-24.58	-14.09	387.95	-34.41	-52.05	327.03	-371.28	377.1	-437.6
		1.5	10.24	6.16		14.33	22.13	-371.52			
	Kanan	3	-24.58	-14.09	-388.21	-34.41	-52.05		327.27	-437.87	377.38
30	Kiri	0	-171.67	-78.24	441.42	-240.34	-331.2	242.77	-551.78	258.59	-668.39
		4	89.29	40.73		125	172.32	248.23	249.89	278.76	280.64
	Kanan	8	-175.65	-80.29	-446.62	-245.91	-339.25	-560.04	243.87	-678.67	259.23
31	Kiri	0	-176.82	-81.03	452.72	-247.54	-341.83	248.31	-566.58	264.17	-686.54
		4	89.3	40.74		125.01	172.34	253.55	254.98	284.13	285.96
	Kanan	8	-170.5	-77.49	-448.89	-238.7	-328.59	-557.45	250.55	-674.77	267.9
32	Kiri	0	-24.65	-14.19	385.65	-34.51	-52.28	324.89	-369.27	374.57	-435.28
		1.5	10.16	6.06		14.23	21.9	-369.51			
	Kanan	3	-24.65	-14.19	-385.91	-34.51	-52.28		325.13	-435.56	374.86
33	Kiri	0	-170.5	-77.49	450.74	-238.7	-328.59	252.22	-559.11	269.84	-676.71
		4	89.3	40.74		125.01	172.34	256.35	255.87	287.3	286.58
	Kanan	8	-176.82	-81.03	-455.64	-247.54	-341.83	-569.22	250.94	-689.61	267.24
34	Kiri	0	-177.63	-81.29	400.02	-248.69	-343.22	200.14	-519.88	207.9	-632.14
		4	89.34	40.49		125.07	171.99	214.93	217.58	244.43	247.5
	Kanan	8	-169.62	-77.74	-396.88	-237.46	-327.92	-509.85	204.54	-619.31	214.14
35	Kiri	0	-24.73	-13.84	328.46	-34.62	-51.81	273.36	-317.87	314.56	-375.21
		1.5	10.09	6.41		14.12	22.37	-318.16			
	Kanan	3	-24.73	-13.84	-328.79	-34.62	-51.81		273.65	-375.55	314.9
36	Kiri	0	-169.62	-77.74	399.26	-237.46	-327.92	206.68	-511.99	216.64	-621.81
		4	89.34	40.49		125.07	171.99	219.07	217.68	248.94	247.34
	Kanan	8	-177.63	-81.29	-403.83	-248.69	-343.22	-523.32	203.58	-636.14	211.9
37	Kiri	0	-177.96	-127.62	323.77	-249.14	-417.75	131.23	-451.56	112.9	-567.02
		4	89.01	66.05		124.62	212.49	167.93	170.65	198.22	201
	Kanan	8	-169.93	-124.29	-321.87	-237.9	-402.78	-442.62	136.74	-555.54	120.38
38	Kiri	0	-24.27	-15.26	252.66	-33.97	-53.53	205.55	-249.23	235	-295.58
		1.5	10.55	4.99		14.77	20.65	-249.33			
	Kanan	3	-24.27	-15.26	-252.76	-33.97	-53.53		205.65	-295.69	235.12
39	Kiri	0	-169.93	-124.29	322.64	-237.9	-402.78	137.44	-443.32	121.2	-556.35
		4	89.01	66.05		124.62	212.49	171	168.71	201.28	199.02
	Kanan	8	-177.96	-127.62	-325.05	-249.14	-417.75	-452.71	132.33	-568.36	114.24
40	Kiri	0	-155.74	-33.74	245.03	-218.04	-240.88	80.36	-360.7	83.13	-431.44
		4	85.06	16.27		119.09	128.1	133.68	129.52	157.2	152.8
	Kanan	8	-151.07	-29.76	-238.04	-211.5	-228.89	-350.2	78.28	-417.95	81.95
41	Kiri	0	-25.41	-4.59	164.14	-35.57	-37.84	124.86	-170.6	144.22	-200.48
		1.5	5.97	2.16		8.35	10.61	-170.46			
	Kanan	3	-25.41	-4.59	-163.99	-35.57	-37.84		124.73	-200.32	144.07
42	Kiri	0	-151.07	-29.76	236.55	-211.5	-228.89	76.93	-348.86	80.38	-416.38
		4	85.06	16.27		119.09	128.1	129.05	132.35	152.32	155.71
	Kanan	8	-155.74	-33.74	-242.56	-218.04	-240.88	-358.47	78.14	-428.85	80.53

KETERANGAN :

1. Kombinasi 1 (komb. 1) = F1D
2. Kombinasi 2 (komb. 2) = F2D + F1G
3. Kombinasi 3 (komb. 3) = 0.9D + 0.9F
4. Kombinasi 4 (komb. 4) = 0.9D + 0.9F
5. Kombinasi 5 (komb. 5) = F0.5D + F0.5(0.3F) + F0.5F
6. Kombinasi 6 (komb. 6) = F0.5D + F0.5(0.3F) + F0.5F

Lampiran 19.a

Perhitungan Perancangan Kolom Portal Lintang As 3 = As 6
Akibat Beban Gempa Daerah 1

	Elemen	1	2	3	4
	Satuan				
Pu	N	1505100	562410	564970	1507650
M.atas (M1b)	N-mm	0	0	0	0
M.bawah (M2b)	N-mm	0	0	0	0
M2s	N-mm	1476090000	1538120000	1544720000	1507030000
d'	mm	40	40	40	40
φ tul.pokok	mm	22	22	22	22
φ tul.sengk.	mm	10	10	10	10
d	mm	1139	1139	1139	1139
β1		0.85	0.85	0.85	0.85

KOLOM

hk	mm	1200	1200	1200	1200
bk	mm	650	650	650	650
Lk	mm	4000	4000	4000	4000

EKSENTRISITAS

e min	mm	51	51	51	51
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KEKAKUAN KOLOM

Ec	MPa	25742.96	25742.96	25742.96	25742.96
βd < 1		0.62103681	0.6323234	0.6323234	0.62103681

INERSIA KOLOM

Ig	mm ⁴	9.36E+10	9.36E+10	9.36E+10	9.36E+10
Ig.atas	mm ⁴	9.36E+10	9.36E+10	9.36E+10	9.36E+10
Ig.bawah	mm ⁴	0	0	0	0

INERSIA BALOK

Icr.a.ka	mm ⁴	5716666667	2083333333	5716666667	0
Icr.a.ki	mm ⁴	0	5716666667	2083333333	5716666667
Icr.b.ka	mm ⁴	0	0	0	0
Icr.b.ki	mm ⁴	0	0	0	0

EI kolom

EI	N-mm ²	5.9457E+14	5.9046E+14	5.9046E+14	5.9457E+14
EIk.atas	N-mm ²	5.9457E+14	5.9046E+14	5.9046E+14	5.9457E+14
EIk.bawah	N-mm ²	0	0	0	0

EI balok

EIb.a.ka	N-mm ²	1.4716E+14	5.3631E+13	1.4716E+14	0
EIb.a.ki	N-mm ²	0	1.4716E+14	5.3631E+13	1.4716E+14
EIb.b.ka	N-mm ²	0	0	0	0
EIb.a.ki	N-mm ²	0	0	0	0
ψA		16.1606969	8.13916932	8.13916932	16.1606969
ψB		0	0	0	0
ψ		8.08034843	4.06958466	4.06958466	8.08034843

dipakai k		2.71202548	2.02641644	2.02641644	2.71202548
$(k.Lk)/(0,3.hk)$		30.1336165	22.5157382	22.5157382	30.1336165
		$22 < kl/r < 100$	$22 < kl/r < 100$	$22 < kl/r < 100$	$22 < kl/r < 100$
P_c	N	49814207.5	88607407.6	88607407.6	49814207.5

Pembesaran momen

ΣP_c	N	276843230	276843230	276843230	276843230
ΣP_u	N	4140130	4140130	4140130	4140130
$\delta_b > 1$		1.04511035	1.00915042	1.00919245	1.04519024
$\delta_s > 1$		1.02183036	1.02183036	1.02183036	1.02183036
M_c	N-mm	1508313571	1571697708	1578441789	1539929002
e	mm	1002.13512	2794.57639	2793.85063	1021.41014

Eksentrisitas balanced=eb

C_b	mm	759.3333	759.3333	759.3333	759.3333
ab	mm	645.433333	645.433333	645.433333	645.433333
f'_s	MPa	568.393327	568.393327	568.393327	568.393327
		$f'_s > f_y$	$f'_s > f_y$	$f'_s > f_y$	$f'_s > f_y$
dipakai	MPa	f_y	f_y	f_y	f_y
C_c	N	10698057.5	10698057.5	10698057.5	10698057.5
C_s	N	2735568	2735568	2735568	2735568
T_s	N	2735568	2735568	2735568	2735568
P_{nb}	N	10698057.5	10698057.5	10698057.5	10698057.5
M_{nb}	N-mm	5972782276	5972782276	5972782276	5972782276
eb	mm	558.305307	558.305307	558.305307	558.305307

Penulangan

ρ total	%	2.40%	2.40%	2.40%	2.40%
$\rho = \rho'$		0.012	0.012	0.012	0.012
$A_s = A_s'$	mm ²	8884.2	8884.2	8884.2	8884.2
A ID22	mm ²	379.94	379.94	379.94	379.94
Σ tul.perlu	buah	24	24	24	24
A perlu	mm ²	9118.56	9118.56	9118.56	9118.56
ρ perlu		0.01231655	0.01231655	0.01231655	0.01231655

Jika $eb > e$, maka keruntuhan kolom berdasarkan desak

P_n	N	-	-	-	-
P_r	N	-	-	-	-
$P_r > P_u$					

Jika $eb < e$, maka keruntuhan kolom berdasarkan tarik

m		11.76471	11.76471	11.76471	11.76471
P_n	N	5338328.83	1345050.16	1345479.25	5199144.71
P_r	N	3736830.18	941535.111	941835.476	3639401.29
$P_r > P_n$		OK	OK	OK	OK

Cek tegangan f'_s

a	mm	322.071121	81.1493309	81.1752188	313.673889
c	mm	378.907201	95.469801	95.5002574	369.028104
f'_s	MPa	536.659953	348.611606	348.691777	534.964303
$f'_s > f_y$		OK	OK	OK	OK

Lampiran 19.b

Perhitungan Perancangan Kolom Portal Lintang As 3 = As 6
Akibat Beban Gempa Daerah 1

	Elemen Satuan	21	22	23	24
P_u	N	196930	127300	126780	196410
M.atas (M1b)	N-mm	0	0	0	0
M.bawah (M2b)	N-mm	0	0	0	0
M_{2s}	N-mm	431440000	562170000	560440000	428850000
d'	mm	40	40	40	40
ϕ tul.pokok	mm	22	22	22	22
ϕ tul.sengk.	mm	10	10	10	10
d	mm	1139	1139	1139	1139
β_1		0.85	0.85	0.85	0.85

KOLOM

hk	mm	1200	1200	1200	1200
bk	mm	650	600	600	650
Lk	mm	5000	5000	5000	5000

EKSENTRISITAS

e min	mm	51	51	51	51
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KEKAKUAN KOLOM

E_c	MPa	25742.96	25742.96	25742.96	25742.96
$\beta_d < 1$		0.7758552	0.78928029	0.78928029	0.7758552

INERSIA KOLOM

I_g	mm ⁴	9.36E+10	8.64E+10	8.64E+10	9.36E+10
$I_{g.atas}$	mm ⁴	0	0	0	0
$I_{g.bawah}$	mm ⁴	9.36E+10	9.36E+10	9.36E+10	9.36E+10

INERSIA BALOK

$I_{c.a.ka}$	mm ⁴	5716666667	2083333333	5716666667	0
$I_{c.a.ki}$	mm ⁴	0	5716666667	2083333333	5716666667
$I_{c.b.ka}$	mm ⁴	5716666667	2083333333	5716666667	0
$I_{c.b.ki}$	mm ⁴	0	5716666667	2083333333	5716666667

EI kolom

EI	N-mm ²	5.4273E+14	4.9723E+14	4.9723E+14	5.4273E+14
$EI_{k.atas}$	N-mm ²	0	0	0	0
$EI_{k.bawah}$	N-mm ²	5.4273E+14	5.3866E+14	5.3866E+14	5.4273E+14

EI balok

$EI_{b.a.ka}$	N-mm ²	1.4716E+14	5.3631E+13	1.4716E+14	0
$EI_{b.a.ki}$	N-mm ²	0	1.4716E+14	5.3631E+13	1.4716E+14
$EI_{b.b.ka}$	N-mm ²	1.4716E+14	5.3631E+13	1.4716E+14	0
$EI_{b.b.ki}$	N-mm ²	0	1.4716E+14	5.3631E+13	1.4716E+14
ψ_A		5.90072537	2.74161076	2.74161076	5.90072537
ψ_B		13.2766321	6.45420866	6.45420866	13.2766321
ψ		9.58867873	4.59790971	4.59790971	9.58867873

dipakai k		2.9286225	2.1293912	2.1293912	2.9286225
(k.Lk)/(0,3.hk)		40.6753126	29.5748777	29.5748777	40.6753126
		22<kl/r<100	22<kl/r<100	22<kl/r<100	22<kl/r<100
Pc	N	24956246.6	43247620.4	43247620.4	24956246.6

Pembesaran momen

ΣP_c	N	136407734	136407734	136407734	136407734
ΣP_u	N	647420	647420	647420	647420
$\delta_b > 1$		1.0114014	1.00422278	1.00420546	1.01137095
$\delta_s > 1$		1.00682659	1.00682659	1.00682659	1.00682659
Mc	N-mm	434385264	566007704	564265894	431777583
e	mm	2205.78512	4446.25062	4450.74849	2198.34826

Eksentrisitas balanced=eb

Cb	mm	759.3333	759.3333	759.3333	759.3333
ab	mm	645.433333	645.433333	645.433333	645.433333
f's	MPa	568.393327	568.393327	568.393327	887200
		f's>fy	f's= fy	f's>fy	f's>fy
dipakai	MPa	fy	fy	fy	fy
Cc	N	10698057.5	9875130	9875130	10698057.5
Cs	N	2735568	3761406	3761406	2735568
Ts	N	2735568	3761406	3761406	2735568
Pnb	N	10698057.5	9875130	9875130	10698057.5
Mnb	N-mm	5972782276	6871994158	6871994158	5972782276
eb	mm	558.305307	695.888981	695.888981	558.305307

Penulangan

ρ total	%	2.40%	3.60%	3.60%	2.40%
$\rho=\rho'$		0.012	0.018	0.018	0.012
As=As'	mm ²	8884.2	12301.2	12301.2	8884.2
A ID22	mm ²	379.94	379.94	379.94	379.94
Σ tul.perlu	buah	24	33	33	24
A perlu	mm ²	9118.56	12538.02	12538.02	9118.56
ρ perlu		0.01231655	0.01834653	0.01834653	0.01231655

Jika $eb > e$, maka keruntuhan kolom berdasarkan desak

Pn	N	-	-	-	-
Pr	N	-	-	-	-
Pr > Pn					

Jika $eb < e$, maka keruntuhan kolom berdasarkan tarik

m		11.76471	11.76471	11.76471	11.76471
Pn	N	1810637.12	1065118.38	1063896.35	1818521.68
Pr	N	1267445.99	745582.866	744727.442	1272965.18
Pr > Pn		OK	OK	OK	OK

Cek tegangan f's

a	mm	109.239042	69.6155804	69.5357089	109.714732
c	mm	128.51652	81.9006828	81.8067163	129.076155
f's	MPa	413.253581	306.96215	306.625555	414.063256
f's > fy		OK	OK	OK	OK