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2. kendaraan roda empat yang akan diangkut dibatasi untuk jenis sedan yang mempunyai ukuran panjang maksimum 4000 mm, lebar maksimum 1700 mm, dan tinggi maksimum 1400 mm.

3. Kendaraan pengangkut sedan tersebut harus mendapat ijin laik jalan dari Depertemen Perhubungan Republik Indonesia.

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DAFTAR PUSTAKA

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RANGKA PUTAR

```
C Beban yang dikenakan pada rangka putar terpusat pada masing-masing
C roda depan sebesar 330kg, dan roda belakang sebesar 220kg. Rangka
C tersebut ditumpu oleh 4 sendi, yaitu 2 sendi disisi kiri dan 2
C sendi di sisi kanan. Rangka diasumsikan sebagai frame. massa dari
C batang diperhitungkan. Satuan panjang dalam (mm) dan satuan massa
C dalam (kg).

SYSTEM
L=1
JOINTS
C Merupakan nomor titik-tiitk nodal
1  X=0       Y=0       Z=2300
3  X=1260                        G=1,3,1
4  X=1900
7  X=4000                        G=4,7,1
8  X=0                 Z=1650
10 X=1260                        G=8,10,1
11 X=1900
14 X=4000                        G=11,14,1
15 X=0                 Z=650
17 X=1260                        G=15,17,1
18 X=1900
21 X=4000                        G=18,21,1
22 X=0                 Z=0
24 X=1260                        G=22,24,1
25 X=1900
28 X=4000                        G=25,28,1
29 X=0       Y=200     Z=2300
31 X=1260                        G=29,31,1
32 X=1900
34 X=3300                        G=32,34,1
35 X=0                 Z=0
37 X=1260                        G=35,37,1
38 X=1900
40 X=3300                        G=38,40,1

RESTRAINS
1  40 1      R=0,0,0,0,0,0
4  25 21     R=1,1,1,1,1,0
5  26 21     R=0,1,1,1,1,0

FRAME
NM=2  NL=2  Y=-1
C  Material rangka memanjang (sejajar sumbu x) adalah kanal baja
C standar Amerika sifat untuk disain C100X8.0 (massa=8kg/m),dengan
C E=200 Gpa.
1 SH=C  T=100,40,7.5,4.7  E=20000  W=0.008
C Material rangka melintang (sejajar sumbu z) adalah kanal baja
C standar Amerika sifat untuk disain C75X6.1 (massa=6.1kg/m),dengan
C E=200 GPa.
2 SH=C  T=75,35,6.9,4.3   E=20000  W=0.0061
```

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```
C Beban yang dikenakan pada struktur
1  PLD=70,330,0
2  PLD=50,220,0
C Nomor elemen
1  1  2  M=1   LP=1,0   NSL=0
2  2  3                 NSL=1
3  3  4                 NSL=0   G=1,1,1,1
5  5  6                 NSL=2
6  6  7                 NSL=0
7  8  9                 NSL=0   G=5,1,1,1
13 15 16                NSL=0   G=5,1,1,1
19 22 23                NSL=0
20 23 24                NSL=1
21 24 25                NSL=0   G=1,1,1,1
23 26 27                NSL=2
24 27 28                NSL=0
25 1  8  M=2   LP=3,0   NSL=0   G=20,1,1,1
46 8  29 M=1            NSL=0
47 1  29       LP=1,0   NSL=0   G=5,1,1,1
53 7  34                NSL=0
54 29 30                NSL=0   G=4,1,1,1
59 15 35       LP=3,0   NSL=0
60 22 35       LP=1,0   NSL=0   G=5,1,1,1
66 28 40                NSL=0
67 35 36                NSL=0   G=4,1,1,1
```

PROGRAM:SAP90/FILE:Rangka Putar.SAP

RANGKA PUTAR

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G E N E R A T E D J O I N T C O O R D I N A T E S

JOINT	X	Y	Z
1	.000	.000	2300.000
2	630.000	.000	2300.000
3	1260.000	.000	2300.000
4	1900.000	.000	2300.000
5	2600.000	.000	2300.000
6	3300.000	.000	2300.000
7	4000.000	.000	2300.000
8	.000	.000	1650.000
9	630.000	.000	1650.000
10	1260.000	.000	1650.000
11	1900.000	.000	1650.000
12	2600.000	.000	1650.000
13	3300.000	.000	1650.000
14	4000.000	.000	1650.000
15	.000	.000	650.000
16	630.000	.000	650.000
17	1260.000	.000	650.000
18	1900.000	.000	650.000
19	2600.000	.000	650.000
20	3300.000	.000	650.000
21	4000.000	.000	650.000
22	.000	.000	.000
23	630.000	.000	.000
24	1260.000	.000	.000
25	1900.000	.000	.000
26	2600.000	.000	.000
27	3300.000	.000	.000
28	4000.000	.000	.000
29	.000	200.000	2300.000
30	630.000	200.000	2300.000
31	1260.000	200.000	2300.000
32	1900.000	200.000	2300.000
33	2600.000	200.000	2300.000
34	3300.000	200.000	2300.000
35	.000	200.000	.000
36	630.000	200.000	.000
37	1260.000	200.000	.000
38	1900.000	200.000	.000
39	2600.000	200.000	.000
40	3300.000	200.000	.000

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R E S T R A I N T D A T A

JOINT	RX	RY	RZ	RXX	RYY	RZZ
4	1	1	1	1	1	0
5	0	1	1	1	1	0
25	1	1	1	1	1	0
26	0	1	1	1	1	0

T O T A L W E I G H T S A N D M A S S E S

PROP	WEIGHT	MASS
1	222.5294	.0000
2	98.2100	.0000
TOTAL	320.7394	.0000

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FINITE ELEMENT ANALYSIS OF STRUCTURES
PROGRAM: SAP90/FILE: Rangka Putar.SAP
RANGKA PUTAR

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
1	1	-69.42	.0	-8.14	7607.88	-1.69	564.32	18.93
			630.0	-13.18	890.66	-1.69	-497.54	
2	1	-478.56	.0	144.33	37830.91	-1.44	482.33	-33.99
			70.0	-186.23	47913.94	-1.44	381.29	
			630.0	-190.71	-57629.85	-1.44	-427.03	
3	1	-1265.09	.0	-183.66	23107.98	-.45	197.92	25.72
			640.0	-188.78	-96071.26	-.45	-89.20	
4	1	-1156.41	.0	221.04	-106905.58			
			700.0	215.44	45865.38			
5	1	-336.80	.0	144.17	-39429.62	1.19	-279.11	15.86
			530.0	-80.07	35855.47	1.19	351.32	
			700.0	-81.43	22127.73	1.19	553.53	
6	1	-101.32	.0	-.78	3713.36	1.02	-502.01	-39.75
			700.0	-6.38	1209.22	1.02	211.18	
7	1	-5.84	.0	-4.87	533.30	-3.71	1535.65	17.48
			630.0	-9.91	-4119.87	-3.71	-802.92	
8	1	-8.98	.0	-20.32	-4111.78	-.90	236.70	-27.38
			630.0	-25.36	-18503.48	-.90	-329.95	
9	1	-10.87	.0	-24.38	-18518.94	-.47	230.10	-53.58
			640.0	-29.50	-35759.81	-.47	-72.31	
10	1	-10.35	.0	31.15	-35756.12	.88	-226.34	63.68
			700.0	25.55	-15912.23	.88	390.33	
11	1	-7.18	.0	21.99	-15898.04	1.37	-505.54	13.37
			700.0	16.39	-2466.13	1.37	453.65	
12	1	-3.75	.0	6.39	-2484.88	2.25	-650.39	-26.29
			700.0	.79	27.01	2.25	922.30	
13	1	-5.84	.0	-4.87	533.30	3.71	-1535.65	-17.48
			630.0	-9.91	-4119.87	3.71	802.92	
14	1	-8.98	.0	-20.32	-4111.78	.90	-236.70	27.38
			630.0	-25.36	-18503.48	.90	329.95	
15	1	-10.87	.0	-24.38	-18518.94	.47	-230.10	53.58
			640.0	-29.50	-35759.81	.47	72.31	

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ELT ID	LOAD COND	AXIAL FORCE	DIST END	1-2 PLANE		1-3 PLANE		AXIAL
16								
			-10.35					-63.68
			.0	31.15	-35756.12	-.88	226.34	
			700.0	25.55	-15912.23	-.88	-390.33	
17								
	1	-7.18						
								-13.37
			.0	21.99	-15898.04	-1.37	505.54	
			700.0	16.39	-2466.13	-1.37	-453.65	
18								
	1	-3.75						
								26.29
			.0	6.39	-2484.88	-2.25	650.39	
			700.0	.79	27.01	-2.25	-922.30	
19								
	1	-69.42						
								-18.93
			.0	-8.14	7607.88	1.69	-564.32	
			630.0	-13.18	890.66	1.69	497.54	
20								
	1	-478.56						
								33.99
			.0	144.33	37830.91	1.44	-482.33	
			70.0	-186.23	47913.94	1.44	-381.29	
			630.0	-190.71	-57629.85	1.44	427.03	
21								
	1	-1265.09						
								-25.72
			.0	-183.66	23107.98	.45	-197.92	
			640.0	-188.78	-96071.26	.45	89.20	
22								
	1	-1156.41						
			.0	221.04	-106905.58			
			700.0	215.44	45865.38			
23								
	1	-336.80						
								-15.86
			.0	144.17	-39429.62	-1.19	279.11	
			530.0	-80.07	35855.47	-1.19	-351.32	
			700.0	-81.43	22127.73	-1.19	-553.53	
24								
	1	-101.32						
								39.75
			.0	-.78	3713.36	-1.02	502.01	
			700.0	-6.38	1209.22	-1.02	-211.18	
25								
	1	4.06						
								-20.28
			.0	2.80	-249.82	1.25	-559.66	
			459.7	.00	394.79	1.25	17.23	
			650.0	-1.16	284.37	1.25	256.00	
26								
	1	-7.74						
								-8.09
			.0	-3.40	1583.92	3.14	-985.44	
			650.0	-7.37	-1916.66	3.14	1054.86	
27								
	1	4.94						
								15.46
			.0	8.00	-1281.66	1.90	-623.04	
			650.0	4.04	2629.80	1.90	609.24	
28								
	1	.59						
								-3.69
			.0	67.66	-30918.18	-.52	177.34	
			650.0	63.70	11773.67	-.52	-163.22	
29								
	1	.21						
								-14.19
			.0	3.46	-1050.92	-3.17	1087.61	
			566.4	.00	-72.47	-3.17	-706.57	
			650.0	-.51	-93.79	-3.17	-971.40	
30								
	1	-3.56						
								18.74
			.0	-2.99	690.25	-3.43	1071.65	
			650.0	-6.95	-2538.64	-3.43	-1158.57	
31								
	1	3.44						
								27.01
			.0	6.23	-401.15	-3.75	1350.23	
			650.0	2.26	2357.51	-3.75	-1086.85	

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ELT LOAD ID COND	AXIAL FORCE	DIST	1-2 PLANE		1-3 PLANE		AXIAL TORQ
32							
		8.45					
		.0	3.05	1018.74	.00	282.06	.00
		500.0	.00	1781.24	.00	282.06	
		1000.0	-3.05	1018.74	.00	282.06	
33							
	1	-10.55					
		.0	3.05	-1871.79	.00	15.23	.00
		500.0	.00	-1109.29	.00	15.23	
		1000.0	-3.05	-1871.79	.00	15.23	
34							
	1	4.51					
		.0	3.05	2656.00	.00	49.19	.00
		500.0	.00	3418.50	.00	49.19	
		1000.0	-3.05	2656.00	.00	49.19	
35							
	1	-.77					
		.0	3.05	11656.40	.00	-9.18	.00
		500.0	.00	12418.90	.00	-9.18	
		1000.0	-3.05	11656.40	.00	-9.18	
36							
	1	-.28					
		.0	3.05	-43.47	.00	-75.53	.00
		500.0	.00	719.03	.00	-75.53	
		1000.0	-3.05	-43.47	.00	-75.53	
37							
	1	-4.44					
		.0	3.05	-2498.98	.00	-54.54	.00
		500.0	.00	-1736.48	.00	-54.54	
		1000.0	-3.05	-2498.98	.00	-54.54	
38							
	1	5.69					
		.0	3.05	2331.22	.00	-164.55	.00
		500.0	.00	3093.72	.00	-164.55	
		1000.0	-3.05	2331.22	.00	-164.55	
39							
	1	4.06					
		.0	1.16	284.37	-1.25	256.00	20.28
		190.3	.00	394.79	-1.25	17.23	
		650.0	-2.80	-249.82	-1.25	-559.66	
40							
	1	-7.74					
		.0	7.37	-1916.66	-3.14	1054.86	8.09
		650.0	3.40	1583.92	-3.14	-985.44	
41							
	1	4.94					
		.0	-4.04	2629.80	-1.90	609.24	-15.46
		650.0	-8.00	-1281.66	-1.90	-623.04	
42							
	1	.59					
		.0	-63.70	11773.67	.52	-163.22	3.69
		650.0	-67.66	-30918.18	.52	177.34	
43							
	1	.21					
		.0	.51	-93.79	3.17	-971.40	14.19
		83.6	.00	-72.47	3.17	-706.57	
		650.0	-3.46	-1050.92	3.17	1087.61	
44							
	1	-3.56					
		.0	6.95	-2538.64	3.43	-1158.57	-18.74
		650.0	2.99	690.25	3.43	1071.65	
45							
	1	3.44					
		.0	-2.26	2357.51	3.75	-1086.85	-27.01
		650.0	-6.23	-401.15	3.75	1350.23	

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ELT ID	LOAD COND	AXIAL FORCE	DIST	1-2 PLANE		1-3 PLANE		AXIAL TORQ
46		2.21	.0	-1.12	-751.85	-4.58	1643.52	-31.05
			146.5	.00	-833.95	-4.58	971.97	
			680.1	4.08	254.31	-4.58	-1472.92	
47	1	-4.54	.0	70.67	-7628.16	-2.37	230.89	4.66
			200.0	70.67	6506.31	-2.37	-243.15	
48	1	154.91	.0	412.28	-36948.34	7.50	-1531.00	-5.58
			200.0	412.28	45508.36	7.50	-31.02	
49	1	15.85	.0	788.42	-80722.37	-5.93	1221.95	1.90
			200.0	788.42	76961.60	-5.93	35.55	
50	1	-411.72	.0	-109.20	10830.64	3.77	-764.77	-17.12
			200.0	-109.20	-11008.62	3.77	-9.80	
51	1	112.61	.0	-822.79	85280.81	-2.60	525.78	-8.01
			200.0	-822.79	-79276.20	-2.60	5.21	
52	1	78.47	.0	-238.91	18433.11	3.73	-634.64	16.10
			200.0	-238.91	-29348.12	3.73	111.76	
53	1	105.29	.0	-16.75	1236.24	-2.42	1194.51	-34.57
			728.0	-11.15	-8916.72	-2.42	-568.21	
54	1	75.25	.0	-1.05	6909.79	-4.05	1412.26	11.16
			630.0	-6.09	4662.36	-4.05	-1139.64	
55	1	487.54	.0	-161.79	50170.72	3.45	-1134.06	-19.86
			630.0	-166.83	-53347.69	3.45	1038.99	
56	1	1275.96	.0	-183.49	23613.91	-2.48	1037.08	15.69
			640.0	-188.61	-95457.56	-2.48	-551.84	
57	1	1166.76	.0	222.31	-106466.18	1.29	-534.72	5.89
			700.0	216.71	47192.44	1.29	369.77	
58	1	343.98	.0	103.30	-32083.76	-1.31	377.77	11.10
			700.0	97.70	38264.85	-1.31	-539.74	
59	1	2.21	.0	1.12	751.85	-4.58	1643.52	31.05
			146.5	.00	833.95	-4.58	971.97	
			680.1	-4.08	-254.31	-4.58	-1472.92	
60	1	-4.54	.0	70.67	-7628.16	2.37	-230.89	-4.66
			200.0	70.67	6506.31	2.37	243.15	
61	1	154.91	.0	412.28	-36948.34	-7.50	1531.00	5.58
			200.0	412.28	45508.36	-7.50	31.02	

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ELT	LOAD ID	COND	AXIAL FORCE	DIST END	1-2 PLANE MOMENT	1-3 PLANE MOMENT	AXIAL TORQ
62				.0	788.42	-80722.37	-1.90
				15.85			
				200.0	788.42	76961.60	
63	1	-411.72		.0	-109.20	10830.64	17.12
				200.0	-109.20	-11008.62	
64	1	112.61		.0	-822.79	85280.81	8.01
				200.0	-822.79	-79276.20	
65	1	78.47		.0	-238.91	18433.11	-16.10
				200.0	-238.91	-29348.12	
66	1	105.29		.0	-16.75	1236.24	34.57
				728.0	-11.15	-8916.72	
67	1	75.25		.0	-1.05	6909.79	-11.16
				630.0	-6.09	4662.36	
68	1	487.54		.0	-161.79	50170.72	19.86
				630.0	-166.83	-53347.69	
69	1	1275.96		.0	-183.49	23613.91	-15.69
				640.0	-188.61	-95457.56	
70	1	1166.76		.0	222.31	-106466.18	-5.89
				700.0	216.71	47192.44	
71	1	343.98		.0	103.30	-32083.76	-11.10
				700.0	97.70	38264.85	

63			5.93	-1221.95	
			5.93	-35.55	
64			-3.77	764.77	
			-3.77	9.80	
65			2.60	-525.78	
			2.60	-5.21	
66			-3.73	634.64	
			-3.73	-111.76	
67			2.42	-1194.51	
			2.42	568.21	
68			4.05	-1412.26	
			4.05	1139.64	
69			-3.45	1134.06	
			-3.45	-1038.99	
70			2.48	-1037.08	
			2.48	551.84	
71			-1.29	534.72	
			-1.29	-369.77	
			1.31	-377.77	
			1.31	539.74	

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FINITE ELEMENT ANALYSIS OF STRUCTURES
PROGRAM: SAP90/FILE: Rangka Putar.sap
RANGKA PUTAR

J O I N T D I S P L A C E M E N T S

LOAD CONDITION 1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	.057773	-2.806573	.000493	-.000071	.000024	.001351
2	.055585	-1.916960	-.000691	.000050	.000017	.001444
3	.040503	-.855937	.000366	-.000168	.000011	.001457
4	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.6983E-03
5	-.040495	.000000	.000000	.000000	.000000	.000006
6	-.052288	-.067714	-.000304	.000113	-.000031	.000140
7	-.055837	.056610	.000340	-.000170	.000002	.000204
8	.008409	-2.850584	.000317	-.000059	.000078	.001558
9	.008225	-1.872373	-.000354	.000053	.000004	.001527
10	.007942	-.962622	.000151	-.000123	.000014	.001299
11	.007594	-.287367	-.000026	-.000472	-.000003	.000736
12	.007232	-.008867	-.000009	-.000018	-.000021	.000151
13	.006980	.004274	-.000149	.000077	-.000015	-.000052
14	.006849	-.043252	.000191	-.000110	-.000046	-.000072
15	.008409	-2.850584	-.000317	.000059	-.000078	.001558
16	.008225	-1.872373	.000354	-.000053	-.000004	.001527
17	.007942	-.962622	-.000151	.000123	-.000014	.001299
18	.007594	-.287367	.000026	.000472	.000003	.000736
19	.007232	-.008867	.000009	.000018	.000021	.000151
20	.006980	.004274	.000149	-.000077	.000015	-.000052
21	.006849	-.043252	-.000191	.000110	.000046	-.000072
22	.057773	-2.806573	-.000493	.000071	-.000024	.001351
23	.055585	-1.916960	.000691	-.000050	-.000017	.001444
24	.040503	-.855937	-.000366	.000168	-.000011	.001457
25	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.6983E-03
26	-.040495	.000000	.000000	.000000	.000000	.000006
27	-.052288	-.067714	.000304	-.000113	.000031	.000140
28	-.055837	.056610	-.000340	.000170	-.000002	.000204
29	-.206612	-2.806619	-.013133	-.000071	.000033	.001347
30	-.204240	-1.915410	.002448	.000000	.000005	.001472
31	-.188875	-.855778	-.027597	-.000127	.000015	.001445
32	-.148024	-.004119	-.003465	-.000025	-.000035	.000698
33	-.107167	.001127	.002379	.000017	-.000016	.000026
34	-.095121	-.066929	.019666	.000096	.000002	.000104
35	-.206612	-2.806619	.013133	.000071	-.000033	.001347
36	-.204240	-1.915410	-.002448	-.000000	-.000005	.001472
37	-.188875	-.855778	.027597	.000127	-.000015	.001445
38	-.148024	-.004119	.003465	.000025	.000035	.000698
39	-.107167	.001127	-.002379	-.000017	.000016	.000026
40	-.095121	-.066929	-.019666	-.000096	-.000002	.000104

R E A C T I O N S A N D A P P L I E D F O R C E S

LOAD CONDITION 1 - FORCES "F" AND MOMENTS "M"

JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
1	.0000E+00	.5731E-10	.0000E+00	.1122E-09	.0000E+00	.1874E-09
2	.0000E+00	.0000E+00	.0000E+00	-.5593E-10	.0000E+00	-.1237E-09
3	.0000E+00	.9376E-11	.0000E+00	.2069E-10	.0000E+00	.1892E-09
4	.4718E-11	.8900E+03	.4812E+01	.3171E+05	.2837E+03	.2219E-09
5	.0000	-179.6359	-1.2006	509.2854	816.4992	.0000
6	.0000E+00	-.1066E-11	.0000E+00	.8868E-11	.0000E+00	-.4002E-10
7	.0000E+00	.0000E+00	.0000E+00	-.1421E-11	.0000E+00	.1273E-10
8	.0000E+00	.0000E+00	.1646E-11	.2623E-09	-.1592E-11	-.8595E-10
9	.0000E+00	.1868E-11	.0000E+00	.1005E-09	.0000E+00	.1321E-09
10	.0000E+00	.0000E+00	.0000E+00	.9550E-11	.0000E+00	.3019E-09

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JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
11	.0000E+00	[illegible]	[illegible]	[illegible]	[illegible]	.2813E-10
12	.0000E+00	[illegible]	[illegible]	[illegible]	.0000E+00	-.1057E-10
13	.0000E+00	[illegible]	[illegible]	[illegible]	.0000E+00	.3242E-11
14	.0000E+00	.0000E+00	.0000E+00	-.3638E-11	.0000E+00	.2336E-11
15	.0000E+00	.1543E-11	.0000E+00	.2830E-09	.1364E-11	.1554E-09
16	.0000E+00	.0000E+00	.0000E+00	.1364E-10	.0000E+00	-.4209E-10
17	.0000E+00	.0000E+00	.0000E+00	.2319E-10	.0000E+00	.8454E-10
18	.0000E+00	.0000E+00	.0000E+00	-.7276E-11	.0000E+00	-.1004E-09
19	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.2704E-11
20	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.2363E-11
21	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.1489E-11
22	.0000E+00	-.3858E-10	.0000E+00	-.4178E-11	.1037E-11	-.3729E-10
23	-.1023E-11	.6784E-10	.0000E+00	.2251E-10	.2552E-11	.3056E-09
24	-.1478E-11	-.1572E-10	.0000E+00	.2024E-10	.1124E-11	.8731E-10
25	.7560E-11	.8900E+03	-.4812E+01	-.3171E+05	-.2837E+03	.3638E-10
26	.0000	-179.6359	1.2006	-509.2854	-816.4992	.0000
27	.0000E+00	.0000E+00	.0000E+00	.1137E-11	.0000E+00	-.1455E-10
28	.0000E+00	.0000E+00	.0000E+00	.3581E-11	.0000E+00	.6366E-11
29	.1606E-11	.0000E+00	-.2045E-11	.3498E-09	.0000E+00	-.1446E-09
30	-.2672E-11	-.2689E-10	.0000E+00	.6587E-11	.0000E+00	-.2183E-10
31	.0000E+00	-.1239E-10	.0000E+00	.4372E-11	.8868E-11	-.1455E-09
32	.1819E-11	.0000E+00	.0000E+00	.0000E+00	.3865E-11	.1455E-09
33	-.3524E-11	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.3638E-10
34	-.1648E-11	.1307E-11	.0000E+00	.1249E-11	.0000E+00	.7276E-11
35	.1293E-11	.3384E-10	-.1270E-11	.9478E-10	.0000E+00	.1019E-09
36	-.7162E-11	-.4900E-10	.0000E+00	.0000E+00	.0000E+00	.0000E+00
37	.5002E-11	.1319E-10	.0000E+00	-.2656E-11	.0000E+00	-.2474E-09
38	-.3638E-11	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.4366E-10
39	-.1307E-11	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.2183E-10
40	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.7276E-11
TOTAL	-.6244E-13	.1421E+04	.1998E-14	.1595E-08	.7474E-09	.8801E-09

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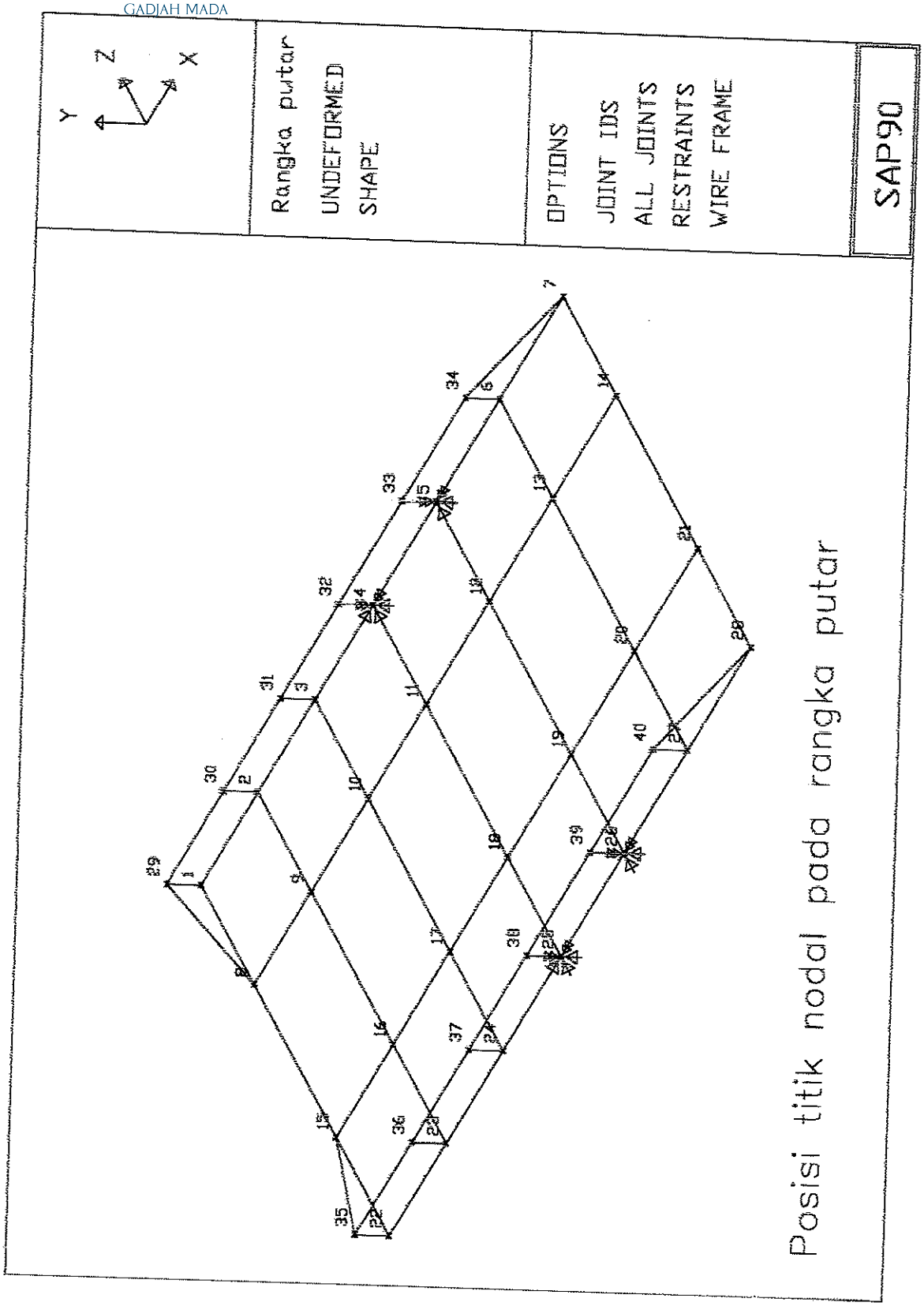

Posisi titik nodal pada rangka putar

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Saut Batara, Prof. Ir. Samsul Kamal, M.Sc., Ph.D.
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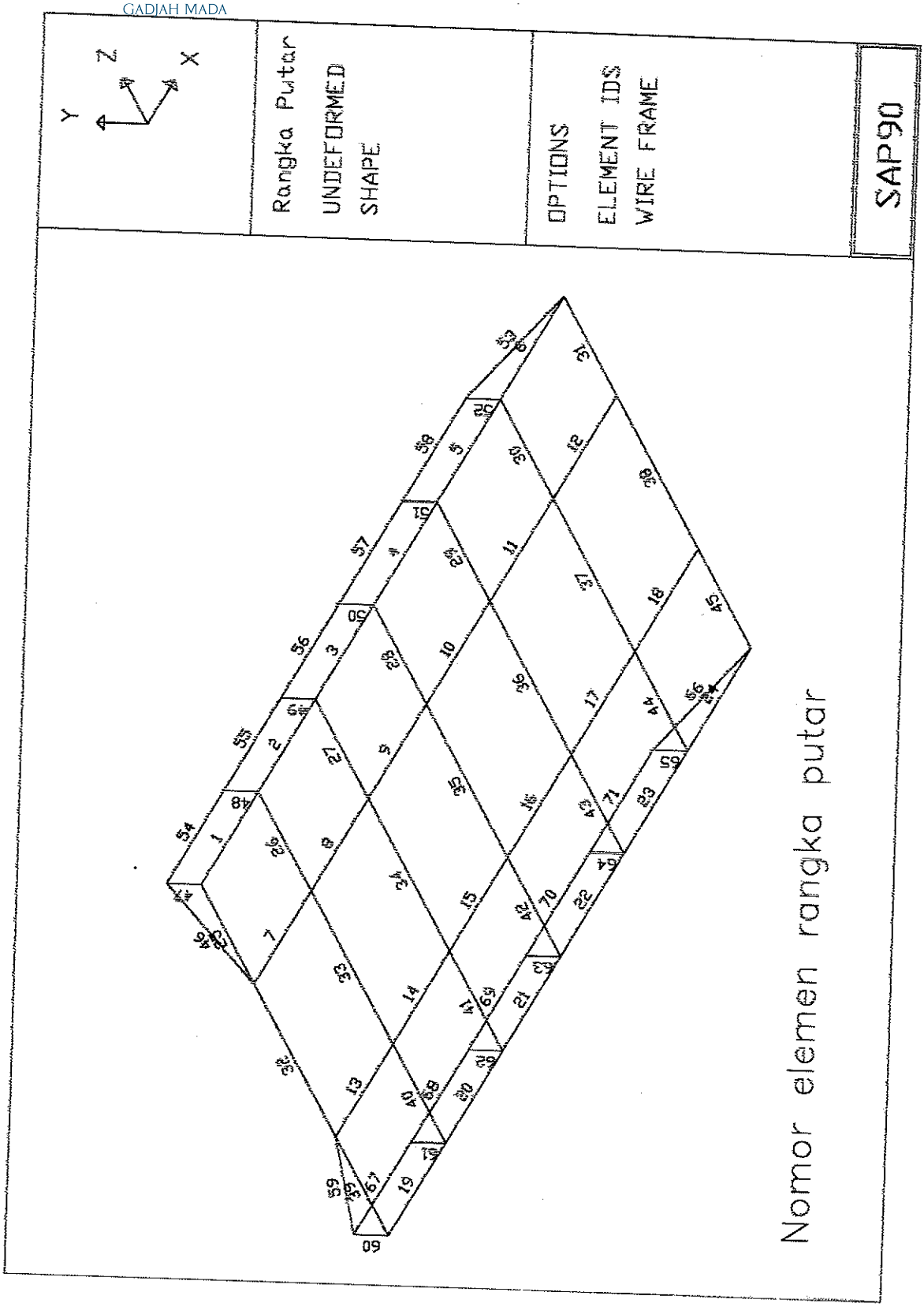

Nomor elemen rangka putar

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Perancangan Kendaraan Pengangkut Sedan Dengan Kapasitas Delapan Sedan
Saut Batara, Prof. Ir. Samsul Kamal, M.Sc., Ph.D.
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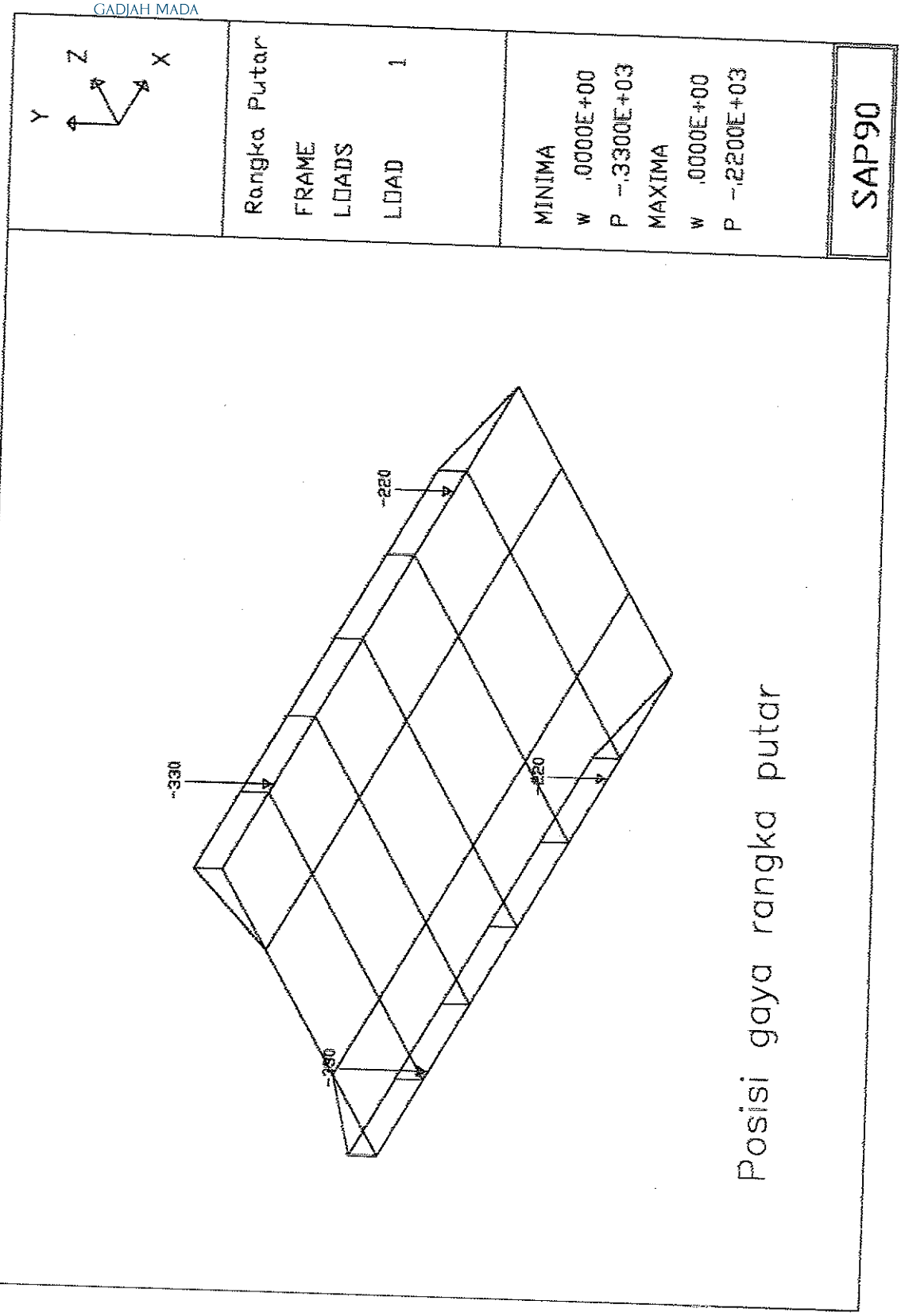

Posisi gaya rangka putar

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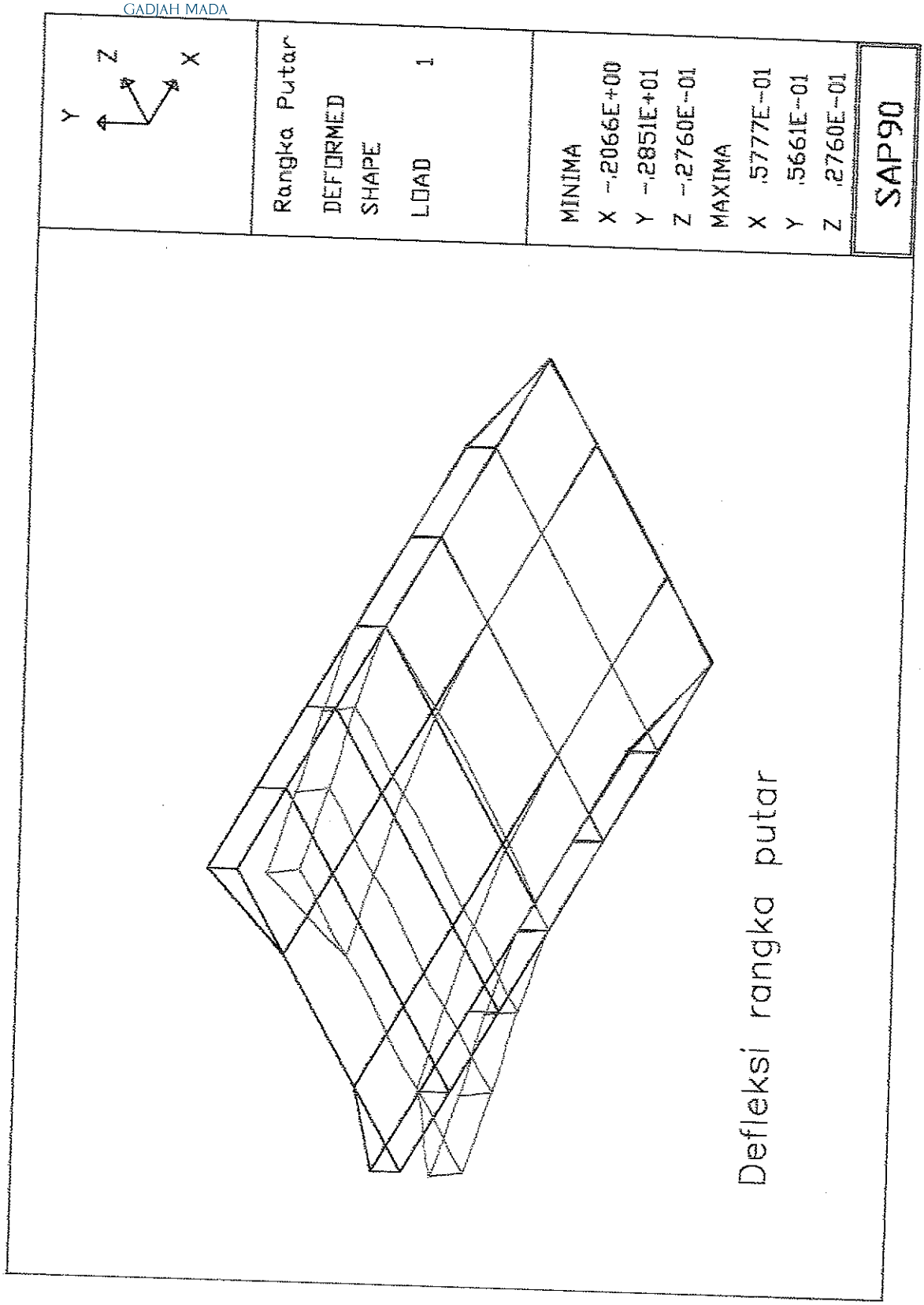

Defleksi rangka putar

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Perancangan Kendaraan Pengangkut Sedan Dengan Kapasitas Delapan Sedan
Saut Batara, Prof. Ir. Samsul Kamal, M.Sc., Ph.D.
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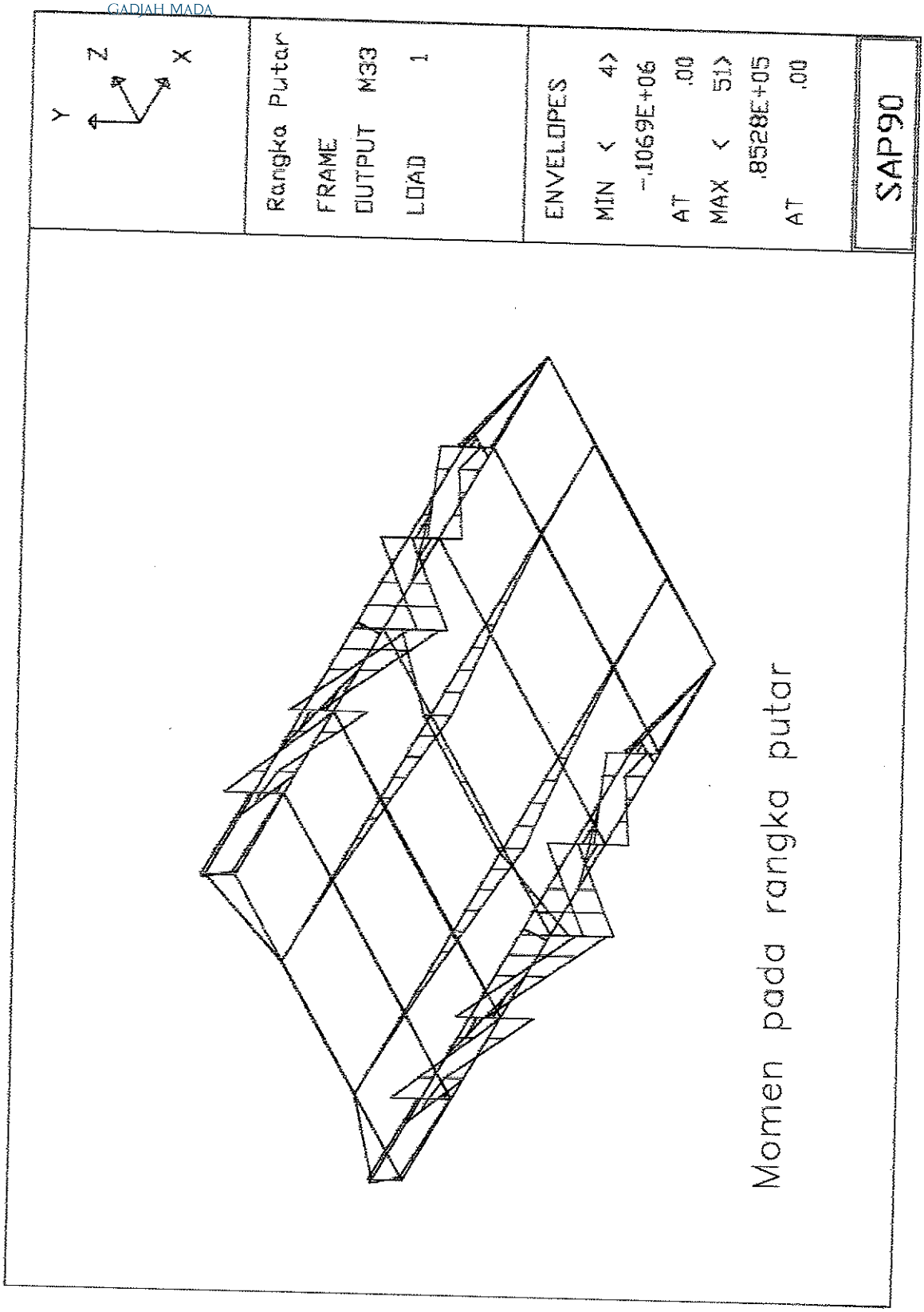

Momen pada rangka putar

Perancangan Kendaraan Pengangkut Sedan Dengan Kapasitas Delapan Sedan
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```
Rangka atas belakang (kapasitas 2 mobil)
C Beban yang dikenakan pada rangka
C da depan sebesar 330kg, dan roda belakang sebesar 220kg.  Satuan
C panjang dalam (mm), dan satuan massa dalam (kg). Rangka ditumpu
C oleh tumpuan.

SYSTEM
L=1
JOINTS
C Merupakan nomor titik-titik nodal
1  X=0       Y=200     Z=2300
2  X=250
10 X=8250                        G=2,10,1
11 X=8450
12 X=0                Z=1650
13 X=250
21 X=8250                        G=13,21,1
22 X=8450
23 X=0                Z=650
24 X=250
32 X=8250                        G=24,32,1
33 X=8450
34 X=0                Z=0
35 X=250
43 X=8250                        G=35,43,1
44 X=8450
45 X=250     Y=0      Z=2300
53 X=8250                        G=45,53,1
54 X=250              Z=0
62 X=8250                        G=54,62,1

RESTRAINS
1  62 1      R=0,0,0,0,0,0
1  34 33     R=1,1,1,1,1,0
11 44 33     R=0,1,1,1,1,0

FRAME
NM=2  NL=4  Y=-1
C Material rangka memanjang (sejajar sumbu x) adalah kanal baja
C standar Amerika sifat untuk disain C100X8.0 (massa=8kg/m),dengan
C E=200 Gpa.
1  SH=C  T=100,40,7.5,4.7  E=20000  W=0.008
C Material rangka melintang (sejajar sumbu z) adalah kanal baja
C standar Amerika sifat untuk disain C75X6.1(massa=6.1kg/m),dengan
C E=200 GPa.
2  SH=C  T=75,35,6.9,4.3   E=20000  W=0.0061
C Beban yang dikenakan pada rangka
1  PLD=340,-330,0
2  PLD=770,-220,0
3  PLD=870,-330,0
4  PLD=300,-220,0
C Nomor elemen
1  1  2  M=1   LP=1,0   NSL=0
2  2  3                 NSL=1
3  3  4                 NSL=0
4  4  5                 NSL=2
```

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```
5   5   6                          NSL=0
6   6   7                          NSL=3
7   7   8                          NSL=0   G=1,1,1,1
9   9   10                         NSL=4
10  10  11                         NSL=0
11  12  13                         NSL=0   G=9,1,1,1
21  23  24                         NSL=0   G=9,1,1,1
31  34  35                         NSL=0
32  35  36                         NSL=1
33  36  37                         NSL=0
34  37  38                         NSL=2
35  38  39                         NSL=0
36  39  40                         NSL=3
37  40  41                         NSL=0   G=1,1,1,1
39  42  43                         NSL=4
40  43  44                         NSL=0
41  1   12  M=2    LP=3,0          NSL=0   G=32,1,1,1
74  1   45  M=1    LP=1,0          NSL=0
75  2   45                         NSL=0   G=8,1,1,1
84  11  53                         NSL=0
85  45  46                         NSL=0   G=7,1,1,1
93  34  54                         NSL=0
94  35  54                         NSL=0   G=8,1,1,1
103 44  62                         NSL=0
104 54  55                         NSL=0   G=7,1,1,1
```

Perancangan Kendaraan Pengangkut Sedan Dengan Kapasitas Delapan Sedan
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FINITE ELEMENT ANALYSIS OF STRUCTURES
PROGRAM:SAP90/FILE:Rangka [illegible]
Rangka atas Selanang (Rangka Landasan) dengan kapasitas 2 sedan

G E N E R A T E D J O I N T C O O R D I N A T E S

JOINT	X	Y	Z
1	.000	200.000	2300.000
2	250.000	200.000	2300.000
3	1250.000	200.000	2300.000
4	2250.000	200.000	2300.000
5	3250.000	200.000	2300.000
6	4250.000	200.000	2300.000
7	5250.000	200.000	2300.000
8	6250.000	200.000	2300.000
9	7250.000	200.000	2300.000
10	8250.000	200.000	2300.000
11	8450.000	200.000	2300.000
12	.000	200.000	1650.000
13	250.000	200.000	1650.000
14	1250.000	200.000	1650.000
15	2250.000	200.000	1650.000
16	3250.000	200.000	1650.000
17	4250.000	200.000	1650.000
18	5250.000	200.000	1650.000
19	6250.000	200.000	1650.000
20	7250.000	200.000	1650.000
21	8250.000	200.000	1650.000
22	8450.000	200.000	1650.000
23	.000	200.000	650.000
24	250.000	200.000	650.000
25	1250.000	200.000	650.000
26	2250.000	200.000	650.000
27	3250.000	200.000	650.000
28	4250.000	200.000	650.000
29	5250.000	200.000	650.000
30	6250.000	200.000	650.000
31	7250.000	200.000	650.000
32	8250.000	200.000	650.000
33	8450.000	200.000	650.000
34	.000	200.000	.000
35	250.000	200.000	.000
36	1250.000	200.000	.000
37	2250.000	200.000	.000
38	3250.000	200.000	.000
39	4250.000	200.000	.000
40	5250.000	200.000	.000
41	6250.000	200.000	.000
42	7250.000	200.000	.000
43	8250.000	200.000	.000
44	8450.000	200.000	.000
45	250.000	.000	2300.000
46	1250.000	.000	2300.000
47	2250.000	.000	2300.000
48	3250.000	.000	2300.000
49	4250.000	.000	2300.000

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JOINT	X	Y	Z
50	5250.000	[illegible]	[illegible]
51	6250.000	.000	2300.000
52	7250.000	.000	2300.000
53	8250.000	.000	2300.000
54	250.000	.000	.000
55	1250.000	.000	.000
56	2250.000	.000	.000
57	3250.000	.000	.000
58	4250.000	.000	.000
59	5250.000	.000	.000
60	6250.000	.000	.000
61	7250.000	.000	.000
62	8250.000	.000	.000

R E S T R A I N T D A T A

JOINT	RX	RY	RZ	RXX	RYY	RZZ
1	1	1	1	1	1	0
11	0	1	1	1	1	0
34	1	1	1	1	1	0
44	0	1	1	1	1	0

T O T A L W E I G H T S A N D M A S S E S

PROP	WEIGHT	MASS
1	436.8480	.0000
2	154.3300	.0000
TOTAL	591.1780	.0000

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FINITE ELEMENT ANALYSIS OF STRUCTURES
PROGRAM:SAP90/FILE:Rangka Landasan F3P
Rangka atas bel[illegible] Landasan Kendaraan kapasitas 2 mobil

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
1	1	-1138.54						-172.60
			.0	-85.27	-11514.63	-50.04	3112.40	
			250.0	-87.27	-33080.97	-50.04	-9397.56	
2	1	-1915.91						13.62
			.0	459.25	-131355.11	-10.76	5191.54	
			340.0	126.53	24326.56	-10.76	1534.64	
			1000.0	121.25	106091.05	-10.76	-5563.96	
3	1	-3344.15						10.36
			.0	168.68	-30242.97	-9.97	5251.26	
			1000.0	160.68	134433.40	-9.97	-4720.87	
4	1	-4598.41						12.89
			.0	172.33	1697.12	-6.45	3554.18	
			770.0	-53.83	132023.30	-6.45	-1410.33	
			1000.0	-55.67	119432.11	-6.45	-2893.21	
5	1	-5195.08						-3.44
			.0	37.00	67554.15	-2.27	1504.76	
			1000.0	29.00	100555.87	-2.27	-766.43	
6	1	-5351.93						21.69
			.0	35.32	81251.41	2.22	-721.52	
			870.0	-301.64	108947.74	2.22	1211.31	
			1000.0	-302.68	69667.32	2.22	1500.11	
7	1	-4635.93						-29.54
			.0	-144.48	151943.54	6.53	-2934.91	
			1000.0	-152.48	3460.68	6.53	3598.68	
8	1	-3314.17						-9.58
			.0	-166.53	138333.53	10.05	-4761.80	
			1000.0	-174.53	-32200.76	10.05	5290.55	
9	1	-1734.42						-15.72
			.0	-88.83	119084.43	10.69	-5566.98	
			300.0	-311.23	92073.46	10.69	-2360.21	
			1000.0	-316.83	-127749.02	10.69	5122.16	
10	1	-981.47						214.33
			.0	120.66	-39912.69	56.50	-9430.16	
			200.0	119.06	-15939.83	56.50	1868.89	
11	1	-50.12						-35.56
			.0	27.71	-61.67	-101.51	14439.52	
			250.0	25.71	6614.70	-101.51	-10937.35	
12	1	-96.37						14.80
			.0	39.57	6573.51	-8.65	3838.04	
			1000.0	31.57	42146.92	-8.65	-4812.66	
13	1	-130.12						5.79
			.0	32.57	42105.62	-9.52	5067.83	
			1000.0	24.57	70678.03	-9.52	-4455.24	
14	1	-156.04						8.33
			.0	23.78	70650.49	-5.95	3272.37	
			1000.0	15.78	90425.55	-5.95	-2681.66	

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ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL STRESS
15	1	-169.81						-3.01
			.0	11.04	90399.59	-2.12	1408.83	
			1000.0	3.04	97437.51	-2.12	-713.90	
16	1	-169.92						14.45
			.0	.55	97443.13	2.09	-683.48	
			68.7	.00	97462.02	2.09	-539.77	
			1000.0	-7.45	93992.86	2.09	1407.90	
17	1	-156.03						-19.12
			.0	-17.27	94003.60	6.02	-2715.13	
			1000.0	-25.27	72736.31	6.02	3309.59	
18	1	-129.88						-4.88
			.0	-25.97	72765.21	9.58	-4486.62	
			1000.0	-33.97	42798.42	9.58	5091.58	
19	1	-95.98						-17.84
			.0	-33.72	42842.42	8.69	-4839.33	
			1000.0	-41.72	5119.32	8.69	3850.09	
20	1	-49.92						53.77
			.0	-25.50	5180.01	126.85	-10844.95	
			200.0	-27.10	-80.21	126.85	14525.67	
21	1	-50.12						35.56
			.0	27.71	-61.67	101.51	-14439.52	
			250.0	25.71	6614.70	101.51	10937.35	
22	1	-96.37						-14.80
			.0	39.57	6573.51	8.65	-3838.04	
			1000.0	31.57	42146.92	8.65	4812.66	
23	1	-130.12						-5.79
			.0	32.57	42105.62	9.52	-5067.83	
			1000.0	24.57	70678.03	9.52	4455.24	
24	1	-156.04						-8.33
			.0	23.78	70650.49	5.95	-3272.37	
			1000.0	15.78	90425.55	5.95	2681.66	
25	1	-169.81						3.01
			.0	11.04	90399.59	2.12	-1408.83	
			1000.0	3.04	97437.51	2.12	713.90	
26	1	-169.92						-14.45
			.0	.55	97443.13	-2.09	683.48	
			68.7	.00	97462.02	-2.09	539.77	
			1000.0	-7.45	93992.86	-2.09	-1407.90	
27	1	-156.03						19.12
			.0	-17.27	94003.60	-6.02	2715.13	
			1000.0	-25.27	72736.31	-6.02	-3309.59	
28	1	-129.88						4.88
			.0	-25.97	72765.21	-9.58	4486.62	
			1000.0	-33.97	42798.42	-9.58	-5091.58	
29	1	-95.98						17.84
			.0	-33.72	42842.42	-8.69	4839.33	
			1000.0	-41.72	5119.32	-8.69	-3850.09	
30	1	-49.92						-53.77
			.0	-25.50	5180.01	-126.85	10844.95	
			200.0	-27.10	-80.21	-126.85	-14525.67	

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ELT ID	LOAD COND	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	MOMENT	1-3 PLANE SHEAR	MOMENT	AXIAL STRESS
31	1	-1138.54						172.60
			.0	-85.27	-11514.63	50.04	-3112.40	
			250.0	-87.27	-33080.97	50.04	9397.56	
32	1	-1915.91						-13.62
			.0	459.25	-131355.11	10.76	-5191.54	
			340.0	126.53	24326.56	10.76	-1534.64	
			1000.0	121.25	106091.05	10.76	5563.96	
33	1	-3344.15						-10.36
			.0	168.68	-30242.97	9.97	-5251.26	
			1000.0	160.68	134433.40	9.97	4720.87	
34	1	-4598.41						-12.89
			.0	172.33	1697.12	6.45	-3554.18	
			770.0	-53.83	132023.30	6.45	1410.33	
			1000.0	-55.67	119432.11	6.45	2893.21	
35	1	-5195.08						3.44
			.0	37.00	67554.15	2.27	-1504.76	
			1000.0	29.00	100555.87	2.27	766.43	
36	1	-5351.93						-21.69
			.0	35.32	81251.41	-2.22	721.52	
			870.0	-301.64	108947.74	-2.22	-1211.31	
			1000.0	-302.68	69667.32	-2.22	-1500.11	
37	1	-4635.93						29.54
			.0	-144.48	151943.54	-6.53	2934.91	
			1000.0	-152.48	3460.68	-6.53	-3598.68	
38	1	-3314.17						9.58
			.0	-166.53	138333.53	-10.05	4761.80	
			1000.0	-174.53	-32200.76	-10.05	-5290.55	
39	1	-1734.42						15.72
			.0	-88.83	119084.43	-10.69	5566.98	
			300.0	-311.23	92073.46	-10.69	2360.21	
			1000.0	-316.83	-127749.02	-10.69	-5122.16	
40	1	-981.47						-214.33
			.0	120.66	-39912.69	-56.50	9430.16	
			200.0	119.06	-15939.83	-56.50	-1868.89	
41	1	-44.13						61.67
			.0	34.72	-15623.72	50.12	-17093.92	
			650.0	30.76	5655.95	50.12	15485.19	
42	1	-62.40						41.19
			.0	20.88	-4209.88	46.25	-14747.86	
			650.0	16.92	8075.41	46.25	15314.99	
43	1	.30						41.30
			.0	8.01	211.05	33.75	-10951.81	
			650.0	4.05	4131.53	33.75	10983.43	
44	1	-4.15						27.54
			.0	6.22	-128.56	25.92	-8371.76	
			650.0	2.25	2624.28	25.92	8476.47	
45	1	-3.17						25.96
			.0	2.28	231.25	13.77	-4455.67	
			373.4	.00	656.55	13.77	688.10	
			650.0	-1.69	423.24	13.77	4497.90	
46	1	-6.33						-5.63
			.0	4.53	-412.55	.11	-32.50	
			650.0	.56	1241.25	.11	36.15	

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ELT	LOAD ID	COND	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	MOMENT	1-3 PLANE SHEAR	MOMENT	AXIAL STRESS
47									
	1		-2.26						-10.74
				.0	-2.80	507.17	-13.89	4491.49	
				650.0	-6.77	-2602.77	-13.89	-4536.02	
48									
	1		-5.11						-28.89
				.0	6.32	-352.73	-26.15	8446.66	
				650.0	2.35	2463.73	-26.15	-8552.81	
49									
	1		.83						-43.99
				.0	7.26	289.04	-33.90	10998.81	
				650.0	3.29	3718.56	-33.90	-11037.19	
50									
	1		-75.26						-60.69
				.0	23.24	-5330.74	-46.06	14707.00	
				650.0	19.27	8484.70	-46.06	-15229.51	
51									
	1		-55.15						-80.21
				.0	34.12	-15349.81	-49.92	16962.53	
				650.0	30.15	5537.01	-49.92	-15485.65	
52									
	1		57.37						.00
				.0	3.05	5691.52	.00	1045.68	
				500.0	.00	6454.02	.00	1045.68	
				1000.0	-3.05	5691.52	.00	1045.68	
53									
	1		-155.26						.00
				.0	3.05	8025.05	.00	539.60	
				500.0	.00	8787.55	.00	539.60	
				1000.0	-3.05	8025.05	.00	539.60	
54									
	1		1.17						.00
				.0	3.05	4140.54	.00	1102.94	
				500.0	.00	4903.04	.00	1102.94	
				1000.0	-3.05	4140.54	.00	1102.94	
55									
	1		-7.72						.00
				.0	3.05	2621.74	.00	748.86	
				500.0	.00	3384.24	.00	748.86	
				1000.0	-3.05	2621.74	.00	748.86	
56									
	1		-7.00						.00
				.0	3.05	434.58	.00	407.42	
				500.0	.00	1197.08	.00	407.42	
				1000.0	-3.05	434.58	.00	407.42	
57									
	1		-10.54						.00
				.0	3.05	1223.79	.00	5.73	
				500.0	.00	1986.29	.00	5.73	
				1000.0	-3.05	1223.79	.00	5.73	
58									
	1		-6.19						.00
				.0	3.05	-2569.19	.00	-412.99	
				500.0	.00	-1806.69	.00	-412.99	
				1000.0	-3.05	-2569.19	.00	-412.99	
59									
	1		-8.66						.00
				.0	3.05	2449.49	.00	-756.59	
				500.0	.00	3211.99	.00	-756.59	
				1000.0	-3.05	2449.49	.00	-756.59	
60									
	1		1.72						.00
				.0	3.05	3731.51	.00	-1106.27	
				500.0	.00	4494.01	.00	-1106.27	
				1000.0	-3.05	3731.51	.00	-1106.27	

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ELT	LOAD ID	COND	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL STRESS
61			-193.42						.00
				.0	3.05	8413.09	.00	-534.47	
				500.0	.00	9175.59	.00	-534.47	
				1000.0	-3.05	8413.09	.00	-534.47	
62									
	1		71.70						.00
				.0	3.05	5590.78	.00	-959.97	
				500.0	.00	6353.28	.00	-959.97	
				1000.0	-3.05	5590.78	.00	-959.97	
63									
	1		-44.13						-61.67
				.0	-30.76	5655.95	-50.12	15485.19	
				650.0	-34.72	-15623.72	-50.12	-17093.92	
64									
	1		-62.40						-41.19
				.0	-16.92	8075.41	-46.25	15314.99	
				650.0	-20.88	-4209.88	-46.25	-14747.86	
65									
	1		.30						-41.30
				.0	-4.05	4131.53	-33.75	10983.43	
				650.0	-8.01	211.05	-33.75	-10951.81	
66									
	1		-4.15						-27.54
				.0	-2.25	2624.28	-25.92	8476.47	
				650.0	-6.22	-128.56	-25.92	-8371.76	
67									
	1		-3.17						-25.96
				.0	1.69	423.24	-13.77	4497.90	
				276.6	.00	656.55	-13.77	688.07	
				650.0	-2.28	231.25	-13.77	-4455.67	
68									
	1		-6.33						5.63
				.0	-.56	1241.25	-.11	36.15	
				650.0	-4.53	-412.55	-.11	-32.50	
69									
	1		-2.26						10.74
				.0	6.77	-2602.77	13.89	-4536.02	
				650.0	2.80	507.17	13.89	4491.49	
70									
	1		-5.11						28.89
				.0	-2.35	2463.73	26.15	-8552.81	
				650.0	-6.32	-352.73	26.15	8446.66	
71									
	1		.83						43.99
				.0	-3.29	3718.56	33.90	-11037.19	
				650.0	-7.26	289.04	33.90	10998.81	
72									
	1		-75.26						60.69
				.0	-19.27	8484.70	46.06	-15229.51	
				650.0	-23.24	-5330.74	46.06	14707.00	
73									
	1		-55.15						80.21
				.0	-30.15	5537.01	49.92	-15485.65	
				650.0	-34.12	-15349.81	49.92	16962.53	
74									
	1		1427.07						-65.33
				.0	-117.96	11576.30	-22.38	6117.31	
				320.2	-119.96	-26509.39	-22.38	-1046.38	
75									
	1		-568.19						158.76
				.0	-823.62	98315.33	23.12	-4023.65	
				200.0	-823.62	-66408.76	23.12	600.47	
76									
	1		-56.24						136.59
				.0	-1461.98	136375.32	-1.08	207.79	
				200.0	-1461.98	-156021.34	-1.08	-9.20	

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ELT ID	LOAD COND	AXIAL FORCE	DIST END	1-2 PLANE STRESS		1-3 PLANE STRESS		AXIAL STRESS
77								
	1	-18.68						96.70
			.0	-1280.18	132763.81	.63	-126.03	
			200.0	-1280.18	-123272.08	.63	-.39	
78								
	1	-95.74						57.70
			.0	-610.45	51903.92	-1.01	214.92	
			200.0	-610.45	-70185.37	-1.01	13.21	
79								
	1	-11.64						-12.41
			.0	-156.95	19298.83	1.84	-387.42	
			200.0	-156.95	-12091.52	1.84	-20.25	
80								
	1	-156.20						-56.46
			.0	729.89	-82286.96	-2.05	455.93	
			200.0	729.89	63690.93	-2.05	45.68	
81								
	1	6.94						-86.17
			.0	1347.91	-134901.74	1.59	-332.77	
			200.0	1347.91	134679.82	1.59	-15.32	
82								
	1	-93.76						-141.27
			.0	1613.65	-151329.18	-1.47	282.90	
			200.0	1613.65	171400.86	-1.47	-10.29	
83								
	1	-461.53						-154.69
			.0	799.00	-87897.02	29.45	-5100.69	
			200.0	799.00	71903.82	29.45	789.63	
84								
	1	1245.55						55.48
			.0	212.26	-16020.04	-28.64	6925.85	
			282.8	213.86	44242.54	-28.64	-1173.95	
85								
	1	2012.28						2.18
			.0	228.31	-92918.15	.75	-699.14	
			1000.0	220.31	131395.57	.75	45.88	
86								
	1	3474.27						11.39
			.0	163.27	-24625.77	-.34	182.48	
			1000.0	155.27	134643.75	-.34	-157.45	
87								
	1	4754.45						11.77
			.0	135.79	11371.67	.29	-60.75	
			1000.0	127.79	143164.92	.29	227.52	
88								
	1	5364.89						-1.43
			.0	31.25	72979.56	-.72	285.22	
			1000.0	23.25	100228.22	-.72	-435.08	
89								
	1	5521.85						18.82
			.0	10.81	88136.70	1.12	-447.50	
			1000.0	2.81	94944.37	1.12	668.01	
90								
	1	4791.96						-26.86
			.0	-154.19	158635.30	-.94	611.55	
			1000.0	-162.19	443.74	-.94	-324.22	
91								
	1	3444.05						-11.54
			.0	-156.06	135123.56	.65	-410.39	
			1000.0	-164.06	-24932.07	.65	241.10	
92								
	1	1830.40						-1.25
			.0	-258.62	146468.79	-.81	99.83	
			1000.0	-266.62	-116146.36	-.81	-714.65	
93								
	1	1427.07						65.33
			.0	-117.96	11576.30	22.38	-6117.31	
			320.2	-119.96	-26509.39	22.38	1046.38	

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ELT ID	LOAD COND	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
94								
	1	-568.19						-158.76
			.0	-823.62	98315.33	-23.12	4023.65	
			200.0	-823.62	-66408.76	-23.12	-600.47	
95								
	1	-56.24						-136.59
			.0	-1461.98	136375.32	1.08	-207.79	
			200.0	-1461.98	-156021.34	1.08	9.20	
96								
	1	-18.68						-96.70
			.0	-1280.18	132763.81	-.63	126.03	
			200.0	-1280.18	-123272.08	-.63	.39	
97								
	1	-95.74						-57.70
			.0	-610.45	51903.92	1.01	-214.92	
			200.0	-610.45	-70185.37	1.01	-13.21	
98								
	1	-11.64						12.41
			.0	-156.95	19298.83	-1.84	387.42	
			200.0	-156.95	-12091.52	-1.84	20.25	
99								
	1	-156.20						56.46
			.0	729.89	-82286.96	2.05	-455.93	
			200.0	729.89	63690.93	2.05	-45.68	
100								
	1	6.94						86.17
			.0	1347.91	-134901.74	-1.59	332.77	
			200.0	1347.91	134679.82	-1.59	15.32	
101								
	1	-93.76						141.27
			.0	1613.65	-151329.18	1.47	-282.90	
			200.0	1613.65	171400.86	1.47	10.29	
102								
	1	-461.53						154.69
			.0	799.00	-87897.02	-29.45	5100.69	
			200.0	799.00	71903.82	-29.45	-789.63	
103								
	1	1245.55						-55.48
			.0	212.26	-16020.04	28.64	-6925.85	
			282.8	213.86	44242.54	28.64	1173.95	
104								
	1	2012.28						-2.18
			.0	228.31	-92918.15	-.75	699.14	
			1000.0	220.31	131395.57	-.75	-45.88	
105								
	1	3474.27						-11.39
			.0	163.27	-24625.77	.34	-182.48	
			1000.0	155.27	134643.75	.34	157.45	
106								
	1	4754.45						-11.77
			.0	135.79	11371.67	-.29	60.75	
			1000.0	127.79	143164.92	-.29	-227.52	
107								
	1	5364.89						1.43
			.0	31.25	72979.56	.72	-285.22	
			1000.0	23.25	100228.22	.72	435.08	
108								
	1	5521.85						-18.82
			.0	10.81	88136.70	-1.12	447.50	
			1000.0	2.81	94944.37	-1.12	-668.01	
109								
	1	4791.96						26.86
			.0	-154.19	158635.30	.94	-611.55	
			1000.0	-162.19	443.74	.94	324.22	
110								
	1	3444.05						11.54
			.0	-156.06	135123.56	-.65	410.39	
			1000.0	-164.06	-24932.07	-.65	-241.10	

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ELT ID	LOAD COND	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
111	1	1830.40	.0	-258.62	146468.79	.81	-99.83	1.25
			1000.0	-266.62	-116146.36	.81	714.65	

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FINITE ELEMENT ANALYSIS OF STRUCTURES
PROGRAM:SAP90/FILE:Rangka Landasan SOI
Rangka atas belakang landasan sedan kapasitas 2 mobil

J O I N T D I S P L A C E M E N T S

LOAD CONDITION 1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	.000000	.000000	.000000	.000000	.000000	-.007855
2	-.014239	-1.976918	-.007920	-.000440	.000253	-.008037
3	-.110082	-10.252932	.000052	-.000301	.000313	-.007217
4	-.277374	-17.100606	-.000440	-.000195	.000227	-.005489
5	-.507409	-21.679061	-.000372	-.000064	.000121	-.002846
6	-.767293	-23.236554	-.000629	-.000099	.000002	-.000071
7	-1.035023	-21.796073	-.000306	.000122	-.000123	.003033
8	-1.266935	-17.033435	-.000513	-.000179	-.000230	.005600
9	-1.432727	-10.041442	.000094	-.000277	-.000315	.007359
10	-1.519491	-1.571622	-.009759	-.000437	-.000243	.007996
11	-1.529311	.000000	.000000	.000000	.000000	.007813
12	-.741650	-.144958	.001922	-.000241	.000291	-.008486
13	-.742277	-2.265978	-.005202	-.000331	.000150	-.008459
14	-.747098	-10.421657	.000039	-.000180	.000307	-.007639
15	-.753607	-17.212203	-.000259	-.000122	.000208	-.005770
16	-.761413	-21.712343	-.000234	-.000037	.000113	-.003111
17	-.769908	-23.295763	-.000353	-.000067	.000002	-.000013
18	-.778408	-21.720659	-.000208	.000080	-.000115	.003143
19	-.786214	-17.137731	-.000290	-.000115	-.000211	.005895
20	-.792711	-10.195560	.000058	-.000165	-.000308	.007809
21	-.797512	-1.869437	-.006481	-.000346	-.000149	.008616
22	-.798011	-.142455	.002402	-.000237	-.000267	.008633
23	-.741650	-.144958	-.001922	.000241	-.000291	-.008486
24	-.742277	-2.265978	.005202	.000331	-.000150	-.008459
25	-.747098	-10.421657	-.000039	.000180	-.000307	-.007639
26	-.753607	-17.212203	.000259	.000122	-.000208	-.005770
27	-.761413	-21.712343	.000234	.000037	-.000113	-.003111
28	-.769908	-23.295763	.000353	.000067	-.000002	-.000013
29	-.778408	-21.720659	.000208	-.000080	.000115	.003143
30	-.786214	-17.137731	.000290	.000115	.000211	.005895
31	-.792711	-10.195560	-.000058	.000165	.000308	.007809
32	-.797512	-1.869437	.006481	.000346	.000149	.008616
33	-.798011	-.142455	-.002402	.000237	.000267	.008633
34	.000000	.000000	.000000	.000000	.000000	-.007855
35	-.014239	-1.976918	.007920	.000440	-.000253	-.008037
36	-.110082	-10.252932	-.000052	.000301	-.000313	-.007217
37	-.277374	-17.100606	.000440	.000195	-.000227	-.005489
38	-.507409	-21.679061	.000372	.000064	-.000121	-.002846
39	-.767293	-23.236554	.000629	.000099	-.000002	-.000071
40	-1.035023	-21.796073	.000306	-.000122	.000123	.003033
41	-1.266935	-17.033435	.000513	.000179	.000230	.005600
42	-1.432727	-10.041442	-.000094	.000277	.000315	.007359
43	-1.519491	-1.571622	.009759	.000437	.000243	.007996
44	-1.529311	.000000	.000000	.000000	.000000	.007813
45	-1.547717	-1.971233	.063031	-.000330	-.000071	-.007933
46	-1.447053	-10.252370	.061143	-.000307	.000034	-.007281
47	-1.273252	-17.100419	.038053	-.000191	.000030	-.005458
48	-1.035411	-21.678103	.013412	-.000071	.000003	-.002905
49	-.767032	-23.236438	.017383	-.000086	.000028	-.000047
50	-.490802	-21.794511	-.022570	.000106	-.000008	.002972
51	-.251084	-17.033504	.033742	-.000168	-.000054	.005599
52	-.078796	-10.040504	.056655	-.000285	-.000027	.007425
53	.012770	-1.567005	.056127	-.000298	.000072	.007943
54	-1.547717	-1.971233	-.063031	.000330	.000071	-.007933
55	-1.447053	-10.252370	-.061143	.000307	-.000034	-.007281
56	-1.273252	-17.100419	-.038053	.000191	-.000030	-.005458
57	-1.035411	-21.678103	-.013412	.000071	-.000003	-.002905
58	-.767032	-23.236438	-.017383	.000086	-.000028	-.000047
59	-.490802	-21.794511	.022570	-.000106	.000008	.002972
60	-.251084	-17.033504	-.033742	.000168	.000054	.005599
61	-.078796	-10.040504	-.056655	.000285	.000027	.007425
62	.012770	-1.567005	-.056127	.000298	-.000072	.007943

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R E A C T I O N S A N D A P P L I E D F O R C E S

LOAD CONDITION 1 : FRONT 2 : SEMI-REAR 3 : REAR 4 : ALL WHEELS

JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
1	.5258E-09	.7493E+03	-.1165E+03	.1967E+05	-.9246E+04	.9622E-09
2	.2274E-11	-.3524E-10	.0000E+00	-.6457E-10	-.4974E-11	.3783E-09
3	.0000E+00	-.1333E-09	.0000E+00	-.1988E-09	.3155E-11	-.2910E-09
4	.2046E-11	.4801E-09	.0000E+00	-.6626E-09	-.5159E-11	-.1513E-08
5	.1603E-10	-.2794E-09	.0000E+00	.5183E-09	-.1268E-10	.7276E-09
6	-.8271E-11	.1088E-08	.0000E+00	.1233E-08	.4089E-11	.1437E-08
7	.7049E-11	.4250E-09	.0000E+00	-.5393E-09	.0000E+00	.8440E-09
8	-.6821E-11	.7142E-09	.0000E+00	-.6197E-09	.5627E-11	-.1281E-08
9	.8185E-11	.2281E-09	.0000E+00	.8947E-10	-.4178E-11	-.1368E-08
10	-.1364E-11	.4871E-10	.0000E+00	-.2365E-10	.7532E-11	.8731E-09
11	-.6526E-10	.6463E+03	-.1403E+03	.2050E+05	.1024E+05	-.1612E-08
12	-.1094E-10	.0000E+00	.0000E+00	.1091E-10	-.2728E-11	.8884E-09
13	-.6787E-11	.3253E-11	.0000E+00	-.1783E-09	.3752E-11	.1695E-09
14	.1490E-10	.0000E+00	.0000E+00	-.2774E-09	.4547E-11	.8845E-10
15	-.1882E-11	.0000E+00	.0000E+00	-.2819E-09	-.2728E-11	-.4429E-09
16	.1812E-11	.6454E-11	.0000E+00	-.1637E-09	-.8640E-11	.2156E-10
17	.5833E-11	-.4148E-11	.0000E+00	.5621E-09	.2795E-11	.5183E-09
18	.4447E-11	.7217E-11	.0000E+00	.8185E-10	.0000E+00	-.3772E-09
19	-.8132E-11	.8133E-11	.0000E+00	-.9213E-09	.0000E+00	.6621E-09
20	.1570E-10	-.1986E-11	.0000E+00	.2342E-09	-.1137E-11	.6259E-09
21	-.1126E-10	.1011E-11	.0000E+00	.1637E-10	-.3638E-11	-.4365E-09
22	-.7401E-11	-.1804E-11	.0000E+00	.2092E-10	-.9777E-11	.2949E-09
23	.4384E-11	-.4206E-11	.0000E+00	.6821E-10	-.7276E-11	-.9625E-09
24	-.2550E-10	.1366E-10	.0000E+00	.2356E-09	-.5457E-11	.6815E-09
25	.3268E-11	-.1309E-11	.0000E+00	.1019E-09	-.1819E-11	.6214E-09
26	-.3499E-11	.4513E-11	.0000E+00	.6921E-09	.3638E-11	.4784E-09
27	.2339E-10	.1523E-11	.0000E+00	.1054E-09	.1182E-10	.1900E-08
28	.0000E+00	-.1141E-10	.0000E+00	-.1206E-08	-.8868E-11	.1113E-08
29	.0000E+00	-.4581E-11	.0000E+00	.1032E-09	.0000E+00	.6105E-09
30	.4409E-11	-.2107E-11	.0000E+00	.3383E-09	.1455E-10	.2110E-08
31	.5798E-11	-.4325E-11	.0000E+00	.2769E-09	.7276E-11	.2224E-09
32	-.5549E-11	-.4917E-11	.0000E+00	-.1091E-10	.3638E-11	-.9151E-09
33	.1351E-10	.3073E-11	.0000E+00	-.3729E-10	.1819E-11	-.8355E-09
34	-.2806E-09	.7493E+03	.1165E+03	-.1967E+05	.9246E+04	-.6385E-09
35	.1251E-11	-.5048E-10	.0000E+00	.1251E-09	.5372E-11	.2765E-09
36	.5457E-11	.4958E-09	.0000E+00	-.1792E-09	.6708E-11	.1601E-08
37	-.4775E-11	-.9284E-09	.0000E+00	.1319E-08	.2429E-10	-.1164E-09
38	-.4434E-11	.7941E-09	.0000E+00	-.2231E-09	.5642E-11	.6476E-09
39	-.6509E-11	.1300E-09	.0000E+00	-.1006E-08	-.1325E-10	.6694E-09
40	.1739E-10	.7990E-09	.0000E+00	.4995E-09	.4427E-11	.2823E-08
41	-.8413E-11	.6170E-09	.0000E+00	-.6481E-09	-.1013E-10	.1717E-08
42	.1796E-10	.1672E-09	.0000E+00	-.5231E-09	.6253E-11	.8149E-09
43	-.7765E-10	-.2041E-10	.0000E+00	.2728E-10	.4491E-11	.4657E-09
44	.5230E-10	.6463E+03	.1403E+03	-.2050E+05	-.1024E+05	-.6221E-09
45	.0000E+00	.2521E-10	.0000E+00	.2279E-10	.3979E-11	-.3929E-09
46	-.1273E-10	-.8973E-10	.0000E+00	-.5130E-11	.0000E+00	-.2801E-09
47	.1637E-10	-.1249E-09	.0000E+00	.0000E+00	-.1525E-10	-.2583E-09
48	.0000E+00	.2918E-09	.0000E+00	-.1939E-11	-.2728E-11	.5821E-10
49	-.1273E-10	.4338E-09	.0000E+00	.1307E-11	.1154E-10	.2619E-09
50	.4547E-11	-.6217E-09	.0000E+00	-.4125E-11	.2740E-10	.6112E-09
51	.1819E-11	-.7375E-10	.0000E+00	-.4766E-11	.1592E-10	.2037E-09
52	.7276E-11	-.1270E-09	.0000E+00	.2736E-11	.6295E-11	-.1804E-08
53	.1000E-10	-.4229E-10	.0000E+00	-.1546E-11	.0000E+00	.2619E-09
54	-.1205E-10	.5383E-10	.0000E+00	.0000E+00	.2615E-11	-.4075E-09
55	.1501E-10	-.1864E-09	.0000E+00	.6305E-10	-.4604E-11	-.1099E-08
56	-.3638E-11	.6745E-09	.0000E+00	.4200E-10	.5102E-11	.1559E-08
57	-.4547E-11	-.1024E-08	.0000E+00	-.3934E-10	-.1251E-10	.1746E-09
58	.5457E-11	-.2666E-09	.0000E+00	.2851E-10	-.3809E-11	.2183E-09
59	-.1091E-10	-.1081E-08	.0000E+00	-.4061E-10	-.5571E-11	.3376E-08
60	.8185E-11	-.9561E-09	.0000E+00	.3283E-10	-.2444E-11	.1455E-09
61	-.2274E-11	-.6190E-10	.0000E+00	.2969E-10	.7262E-11	.9895E-09
62	-.1319E-10	.3791E-10	.0000E+00	.5689E-11	.3297E-11	-.3783E-09
TOTAL	-.4965E-12	.2791E+04	.5834E-13	.1068E-06	-.1379E-06	.1707E-07

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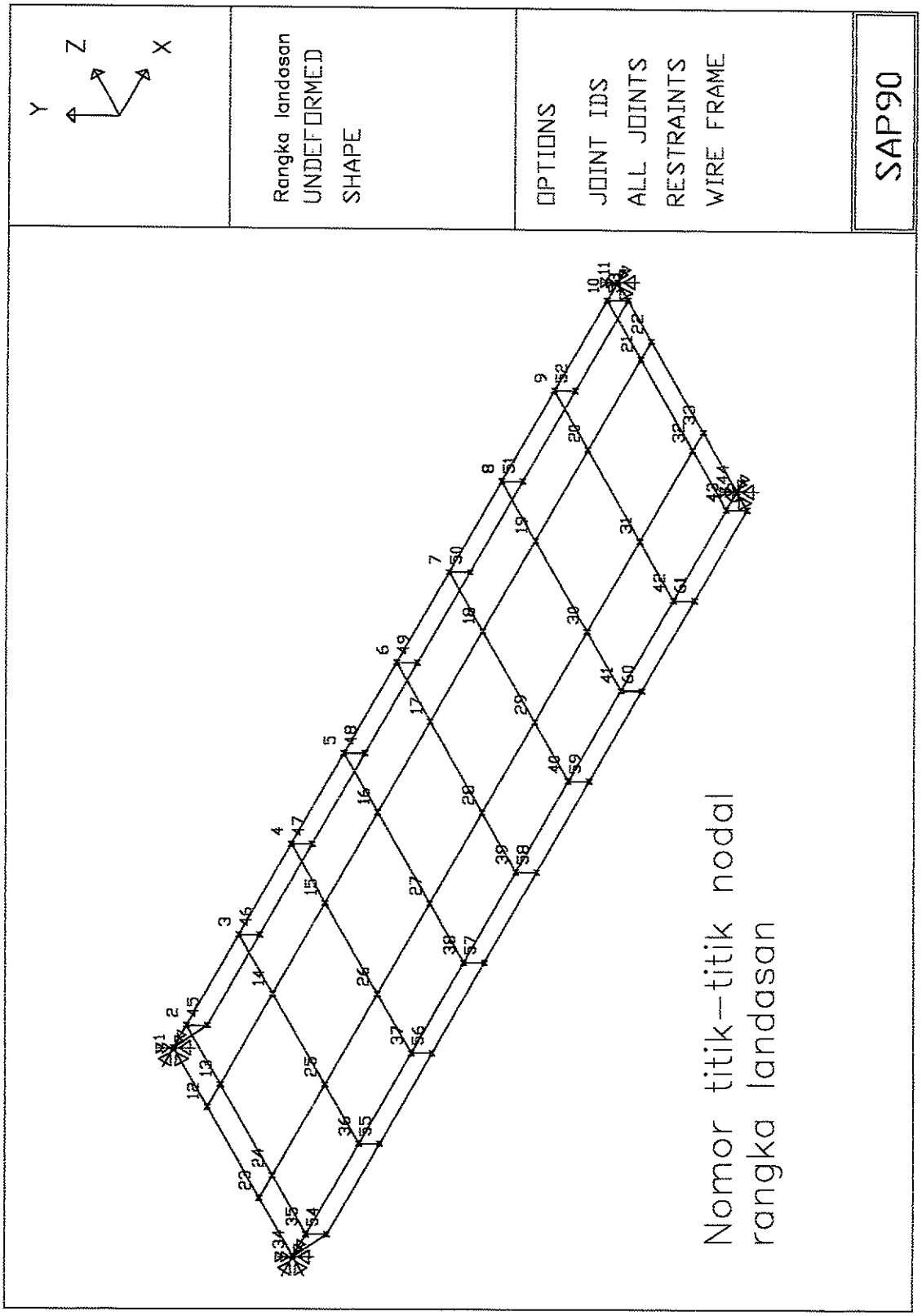

Nomor titik–titik nodal
rangka landasan

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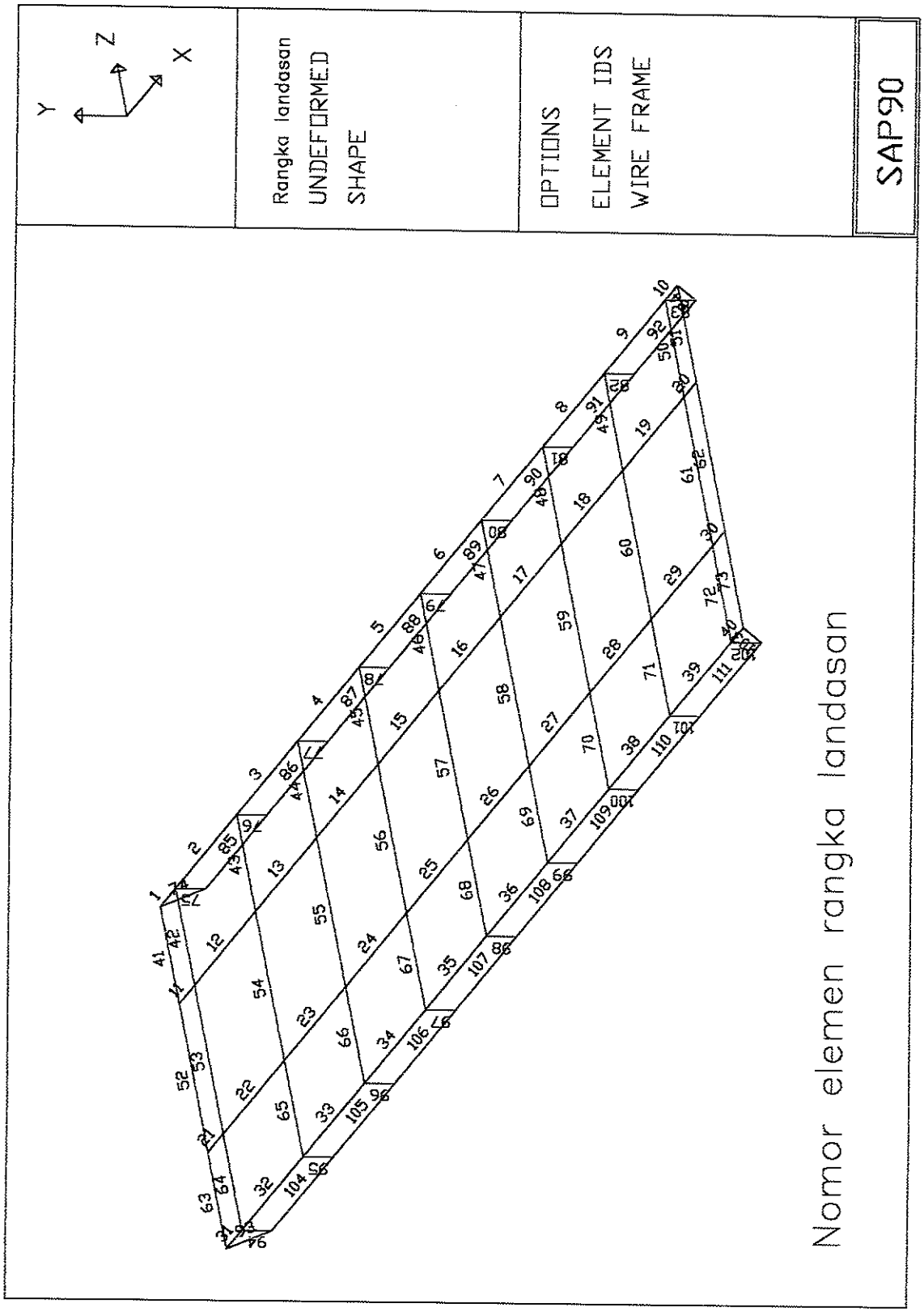

Nomor elemen rangka landasan

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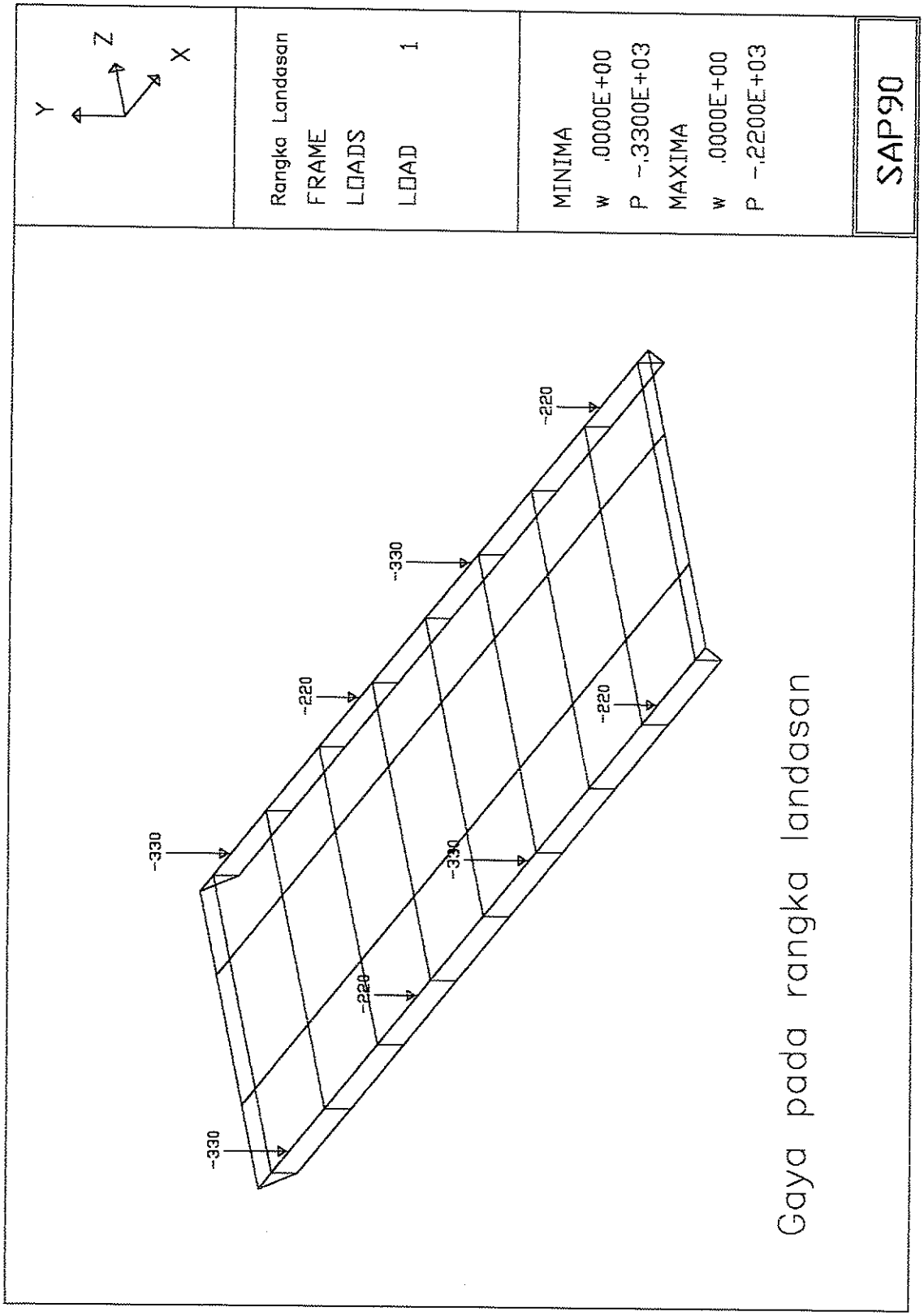

Gaya pada rangka landasan

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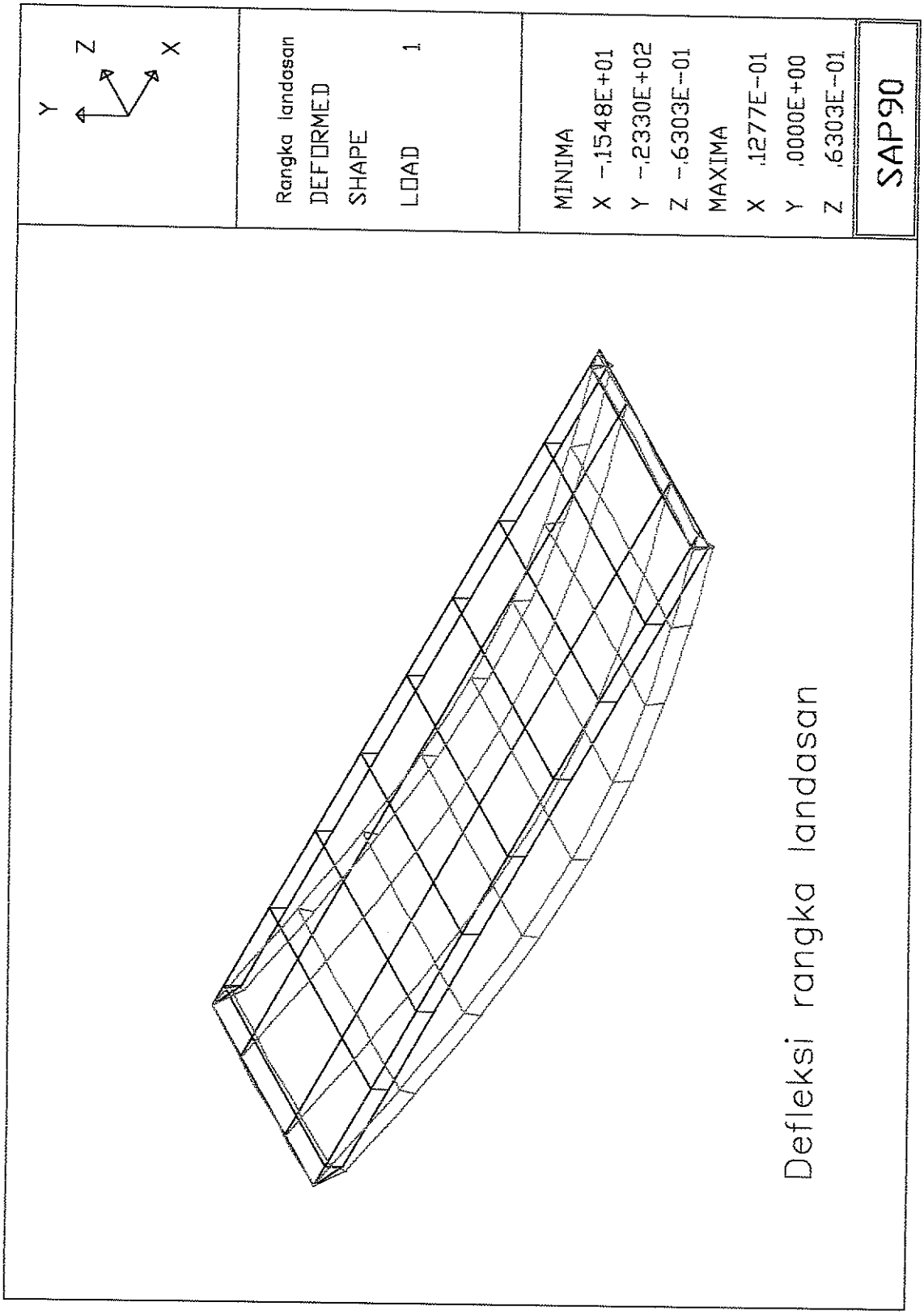

Defleksi rangka landasan

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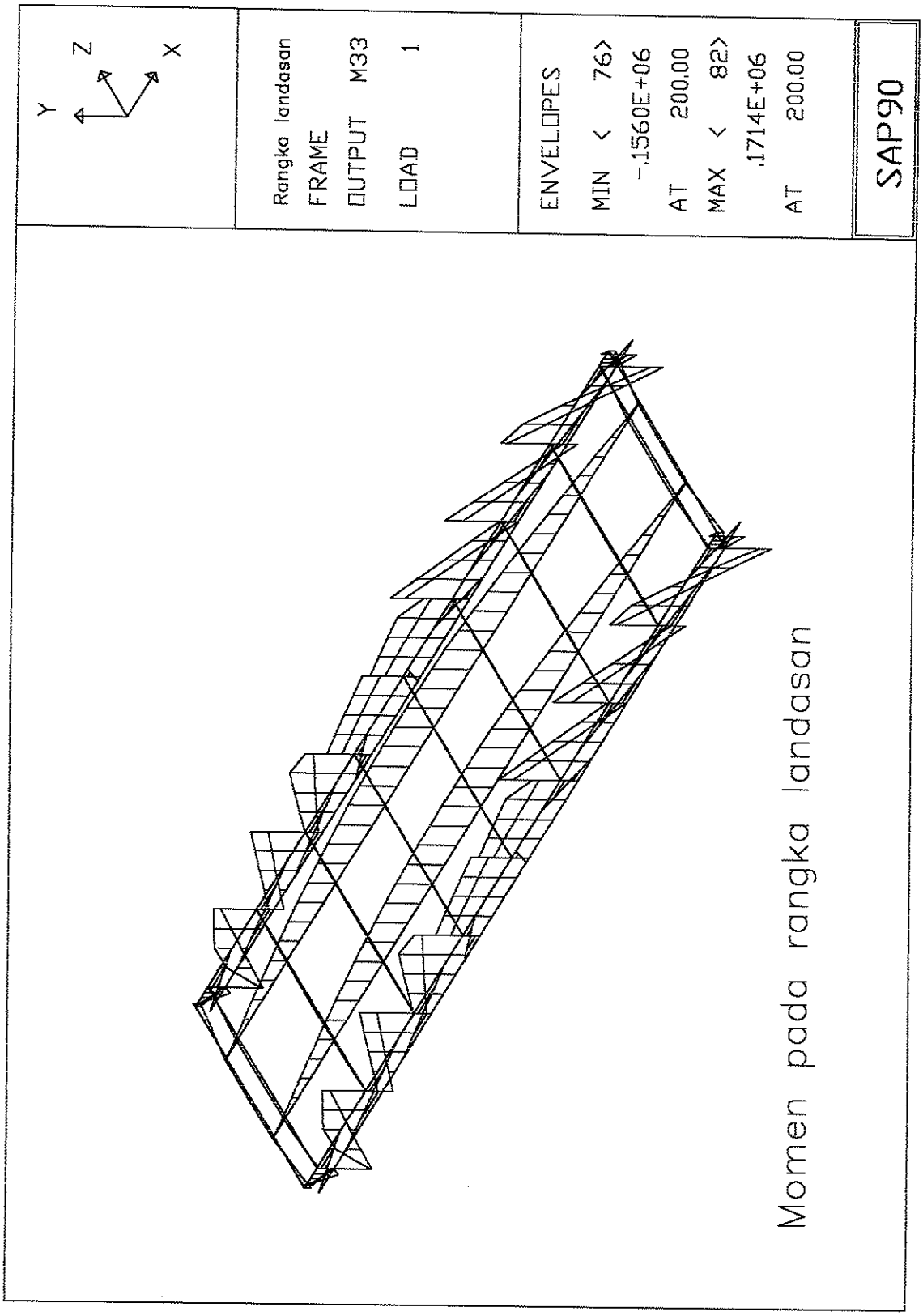

Momen pada rangka landasan

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RANGKA BAKAR

```
C Beban yang dikenakan pada rangka terpusat pada masing-masing
C roda depan sebesar 330kg, dan roda belakang sebesar 220kg. Rangka
C tersebut ditumpu oleh 4 sendi, yaitu 2 sendi disisi kiri dan 2
C sendi di sisi kanan. Massa dari batang diperhitungkan. Satuan pan-
C jang dalam (mm), dan satuan massa dalam (kg).

SYSTEM
L=1
JOINTS
C Merupakan nomor titik-tiitk nodal
1  X=0       Y=0       Z=2300
3  X=1260                        G=1,3,1
4  X=1900
6  X=3300                        G=4,6,1
7  X=0                 Z=1650
9  X=1260                        G=7,9,1
10 X=1900
12 X=3300                        G=10,12,1
13 X=0                 Z=650
15 X=1260                        G=13,15,1
16 X=1900
18 X=3300                        G=16,18,1
19 X=0                 Z=0
21 X=1260                        G=19,21,1
22 X=1900
24 X=3300                        G=22,24,1

RESTRAINS
1  24 1      R=0,0,0,0,0,0
1  19 18     R=1,1,1,1,1,0
5  23 18     R=0,1,1,1,1,0

FRAME
NM=2  NL=2  Y=-1
C Material rangka memanjang (sejajar sumbu x) adalah kanal baja
C standar Amerika sifat untuk disain C100X8.0 (massa=8kg/m),dengan
C E=200 Gpa.
1  SH=C  T=100,40,7.5,4.7  E=20000  w=0.008
C Material rangka melintang (sejajar sumbu z) adalah kanal baja
C standar Amerika sifat untuk disain C75X6.1(massa=6.1kg/m),dengan
C E=200 GPa.
2  SH=C  T=75,35,6.9,4.3   E=20000  w=0.0061
C Beban yang dikenakan pada rangka
1  PLD=70,-330,0
2  PLD=530,-220,0
C Nomor elemen
1  1  2  M=1   LP=1,0   NSL=0
2  2  3                 NSL=1
3  3  4                 NSL=0
4  4  5                 NSL=0
5  5  6                 NSL=2
```

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```
6  7  8                    NSL=0   G=4,1,1,1
11 13 14                   NSL=0   G=4,1,1,1
16 19 20                   NSL=0
17 20 21                   NSL=1
18 21 22                   NSL=0
19 22 23                   NSL=0
20 23 24                   NSL=2
21 1  7  M=2   LP=3,0      NSL=0   G=17,1,1,1
```

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G E N E R A T E D J O I N T C O O R D I N A T E S

JOINT	X	Y	Z
1	.000	.000	2300.000
2	630.000	.000	2300.000
3	1260.000	.000	2300.000
4	1900.000	.000	2300.000
5	2600.000	.000	2300.000
6	3300.000	.000	2300.000
7	.000	.000	1650.000
8	630.000	.000	1650.000
9	1260.000	.000	1650.000
10	1900.000	.000	1650.000
11	2600.000	.000	1650.000
12	3300.000	.000	1650.000
13	.000	.000	650.000
14	630.000	.000	650.000
15	1260.000	.000	650.000
16	1900.000	.000	650.000
17	2600.000	.000	650.000
18	3300.000	.000	650.000
19	.000	.000	.000
20	630.000	.000	.000
21	1260.000	.000	.000
22	1900.000	.000	.000
23	2600.000	.000	.000
24	3300.000	.000	.000

R E S T R A I N T D A T A

JOINT	RX	RY	RZ	RXX	RYY	RZZ
1	1	1	1	1	1	0
5	0	1	1	1	1	0
19	1	1	1	1	1	0
23	0	1	1	1	1	0

T O T A L W E I G H T S A N D M A S S E S

PROP	WEIGHT	MASS
1	105.6000	.0000
2	84.1800	.0000
TOTAL	189.7800	.0000

FINITE ELEMENT ANALYSIS OF STRUCTURES
PROGRAM:SAP90/FILE:Rangka Bawah.F3F
RANGKA BAWAH

Perancangan Kendaraan Pengangkut Sedan Dengan Kapasitas Delapan Sedan
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F R A M E E L E M E N T F O R C E S

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ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
1								
	1	.00						168.04
			.0	182.99	-153.45			
			630.0	177.95	113544.04			
2								
	1	.00						-36.62
			.0	203.21	113479.88			
			70.0	-127.35	127685.05			
			630.0	-131.83	55117.36			
3								
	1	.00						-156.32
			.0	-112.49	55192.87			
			640.0	-117.61	-18437.36			
4								
	1	.00						24.64
			.0	-123.50	-18357.55			
			700.0	-129.10	-106766.70			
5								
	1	.00						102.28
			.0	208.98	-106813.71			
			530.0	-15.26	2823.26			
			700.0	-16.62	113.88			
6								
	1	.00						153.94
			.0	41.54	153.45			
			630.0	36.50	24735.06			
7								
	1	.00						-22.15
			.0	4.22	24799.22			
			527.7	.00	25912.89			
			630.0	-.82	25870.99			
8								
	1	.00						-95.19
			.0	-27.17	25795.48			
			640.0	-32.29	6766.91			
9								
	1	.00						-58.17
			.0	-33.42	6687.10			
			700.0	-39.02	-18663.80			
10								
	1	.00						135.33
			.0	29.23	-18616.79			
			700.0	23.63	-113.88			
11								
	1	.00						-153.94
			.0	41.54	153.45			
			630.0	36.50	24735.06			
12								
	1	.00						22.15
			.0	4.22	24799.22			
			527.7	.00	25912.89			
			630.0	-.82	25870.99			
13								
	1	.00						95.19
			.0	-27.17	25795.48			
			640.0	-32.29	6766.91			
14								
	1	.00						58.17
			.0	-33.42	6687.10			
			700.0	-39.02	-18663.80			

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ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
15								
	1	.00						-135.33
			.0	29.23	-18616.79			
			700.0	23.63	-113.88			
16								
	1	.00						-168.04
			.0	182.99	-153.45			
			630.0	177.95	113544.04			
17								
	1	.00						36.62
			.0	203.21	113479.88			
			70.0	-127.35	127685.05			
			630.0	-131.83	55117.36			
18								
	1	.00						156.32
			.0	-112.49	55192.87			
			640.0	-117.61	-18437.36			
19								
	1	.00						-24.64
			.0	-123.50	-18357.55			
			700.0	-129.10	-106766.70			
20								
	1	.00						-102.28
			.0	208.98	-106813.71			
			530.0	-15.26	2823.26			
			700.0	-16.62	113.88			
21								
	1	.00						-153.45
			.0	48.55	-21991.70			
			650.0	44.59	8279.40			
22								
	1	.00						-64.17
			.0	-25.26	204.66			
			650.0	-29.23	-17504.40			
23								
	1	.00						75.51
			.0	-19.34	119.70			
			650.0	-23.30	-13738.86			
24								
	1	.00						79.81
			.0	5.89	-180.96			
			650.0	1.93	2359.93			
25								
	1	.00						-47.02
			.0	75.26	-34429.44			
			650.0	71.30	13203.09			
26								
	1	.00						-113.88
			.0	-16.62	102.28			
			650.0	-20.58	-11987.87			
27								
	1	.00						.00
			.0	3.05	8125.46			
			500.0	.00	8887.96			
			1000.0	-3.05	8125.46			
28								
	1	.00						.00
			.0	3.05	-17328.31			
			500.0	.00	-16565.81			
			1000.0	-3.05	-17328.31			
29								
	1	.00						.00
			.0	3.05	-13665.82			
			500.0	.00	-12903.32			
			1000.0	-3.05	-13665.82			

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ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
30	1	.00	.0	3.05	2322.91			.00
			500.0	.00	3085.41			
			1000.0	-3.05	2322.91			
31	1	.00	.0	3.05	13009.59			.00
			500.0	.00	13772.09			
			1000.0	-3.05	13009.59			
32	1	.00	.0	3.05	-11852.54			.00
			500.0	.00	-11090.04			
			1000.0	-3.05	-11852.54			
33	1	.00	.0	-44.59	8279.40			153.45
			650.0	-48.55	-21991.70			
34	1	.00	.0	29.23	-17504.40			64.17
			650.0	25.26	204.66			
35	1	.00	.0	23.30	-13738.86			-75.51
			650.0	19.34	119.70			
36	1	.00	.0	-1.93	2359.93			-79.81
			650.0	-5.89	-180.96			
37	1	.00	.0	-71.30	13203.09			47.02
			650.0	-75.26	-34429.44			
38	1	.00	.0	20.58	-11987.87			113.88
			650.0	16.62	102.28			

FINITE ELEMENT ANALYSIS OF STRUCTURES
PROGRAM:SAP90/FILE:Rangka Bawah.SOL
RANGKA BAWAH

Perancangan Kendaraan Pengangkut Sedan Dengan Kapasitas Delapan Sedan
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J O I N T D I S P L A C E M E N T S

LOAD CONDITION 1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	.000000	.000000	.000000	.000000	.000000	-.002312
2	.000000	-1.240705	.000000	.001079	.000000	-.001136
3	.000000	-1.243675	.000000	.000844	.000000	.000820
4	.000000	-.491046	.000000	-.000176	.000000	.001211
5	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.2157E-03
6	.000000	-.654837	.000000	.000729	.000000	-.001107
7	.000000	-.203865	.000000	-.000335	.000000	-.000742
8	.000000	-.622436	.000000	.000653	.000000	-.000480
9	.000000	-.760073	.000000	.000511	.000000	.000048
10	.000000	-.591841	.000000	-.000110	.000000	.000395
11	.000000	-.319935	.000000	-.000525	.000000	.000265
12	.000000	-.236748	.000000	.000440	.000000	.000058
13	.000000	-.203865	.000000	.000335	.000000	-.000742
14	.000000	-.622436	.000000	-.000653	.000000	-.000480
15	.000000	-.760073	.000000	-.000511	.000000	.000048
16	.000000	-.591841	.000000	.000110	.000000	.000395
17	.000000	-.319935	.000000	.000525	.000000	.000265
18	.000000	-.236748	.000000	-.000440	.000000	.000058
19	.000000	.000000	.000000	.000000	.000000	-.002312
20	.000000	-1.240705	.000000	-.001079	.000000	-.001136
21	.000000	-1.243675	.000000	-.000844	.000000	.000820
22	.000000	-.491046	.000000	.000176	.000000	.001211
23	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	-.2157E-03
24	.000000	-.654837	.000000	-.000729	.000000	-.001107

R E A C T I O N S A N D A P P L I E D F O R C E S

LOAD CONDITION 1 - FORCES "F" AND MOMENTS "M"

JOINT	F(Y)	M(X)	M(Z)
1	.2315E+03	.2182E+05	.6042E-10
2	.0000E+00	-.1322E-10	.9479E-10
3	.0000E+00	-.5217E-10	-.2362E-10
4	.0000E+00	.0000E+00	-.4762E-10
5	.4133E+03	.3435E+05	-.2282E-10
6	.0000E+00	-.3610E-11	.0000E+00
7	.0000E+00	-.6366E-11	-.1235E-10
8	.0000E+00	-.1455E-10	-.1474E-10
9	.0000E+00	-.3456E-10	.1999E-10
10	.0000E+00	.4547E-11	-.6075E-11
11	.0000E+00	-.1091E-10	-.2658E-11
12	.0000E+00	.5457E-11	.3626E-10
13	.0000E+00	-.1819E-11	.2763E-10
14	.0000E+00	-.2910E-10	-.3661E-10
15	.0000E+00	.5457E-11	-.1183E-09
16	.0000E+00	.4547E-11	.9224E-10
17	.0000E+00	.1091E-10	.1552E-10
18	.0000E+00	-.5457E-11	.0000E+00
19	.2315E+03	-.2182E+05	.2188E-11
20	.0000E+00	-.4349E-11	.9480E-10
21	.0000E+00	.2265E-10	.5642E-10
22	.0000E+00	.1509E-10	.3602E-10
23	.4133E+03	-.3435E+05	-.2278E-10
24	.0000E+00	.2177E-10	-.9166E-11
TOTAL	.1290E+04	-.9464E-10	.2199E-09

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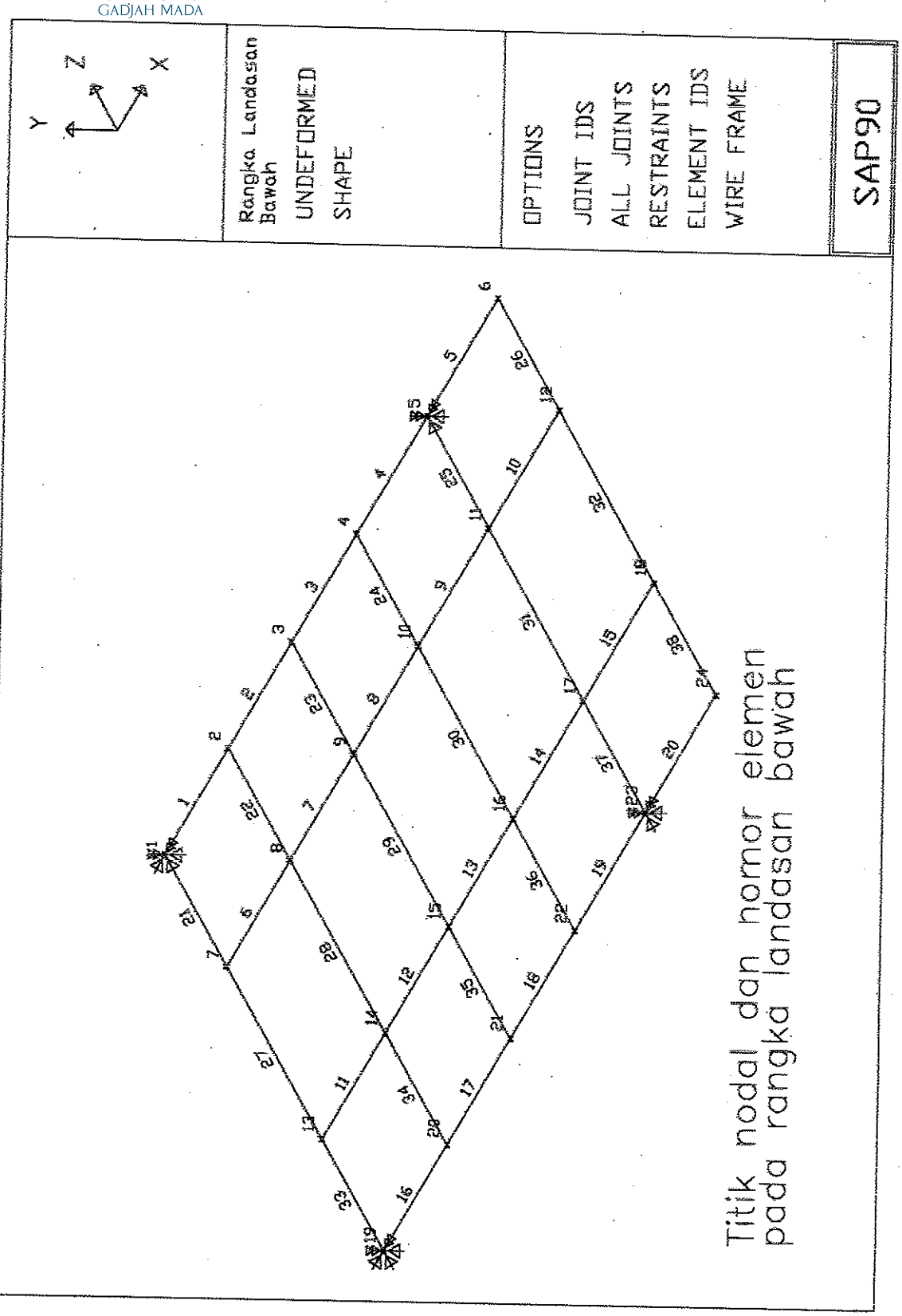

Titik nodal dan nomor elemen pada rangka landasan bawah

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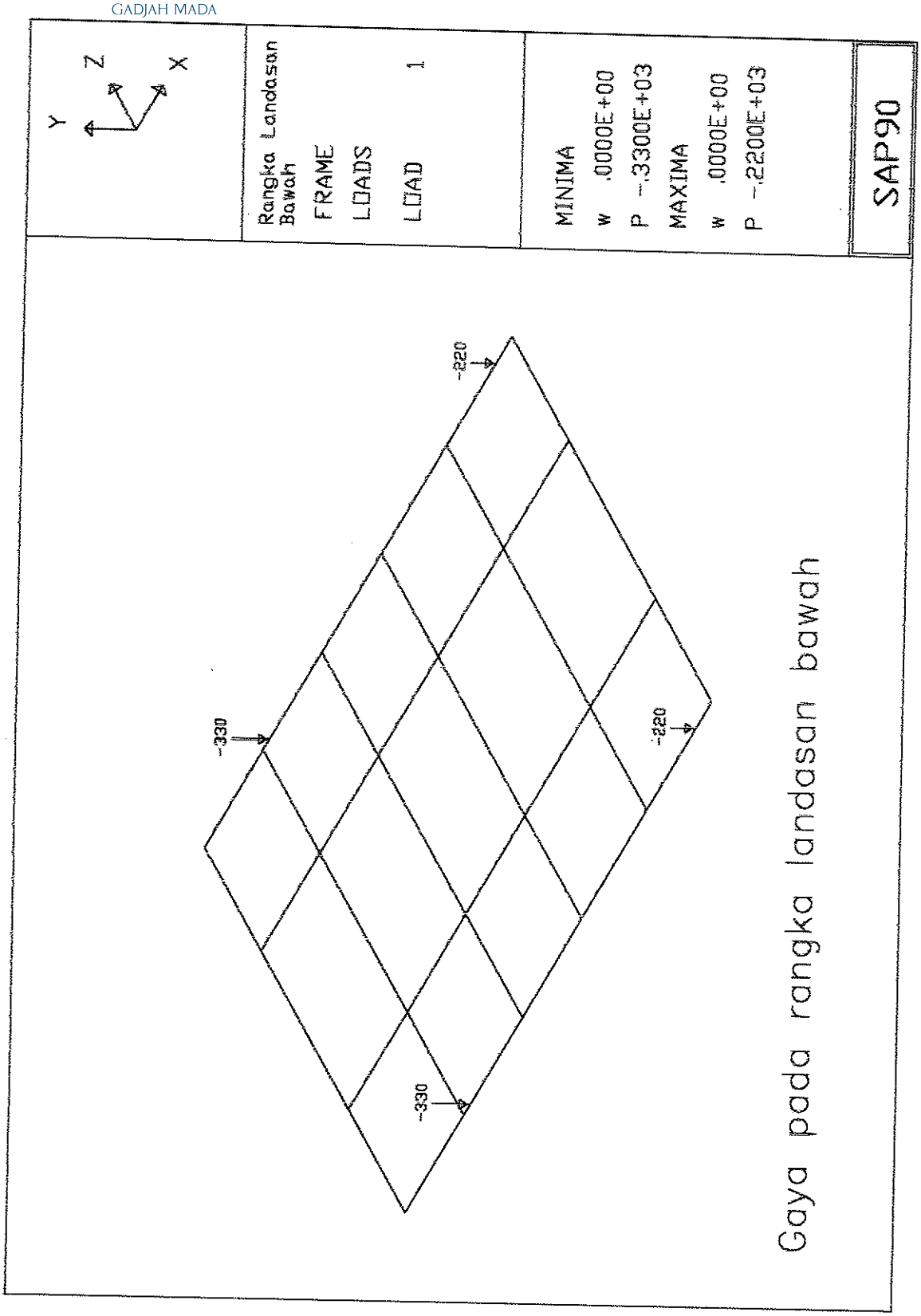

Gaya pada rangka landasan bawah

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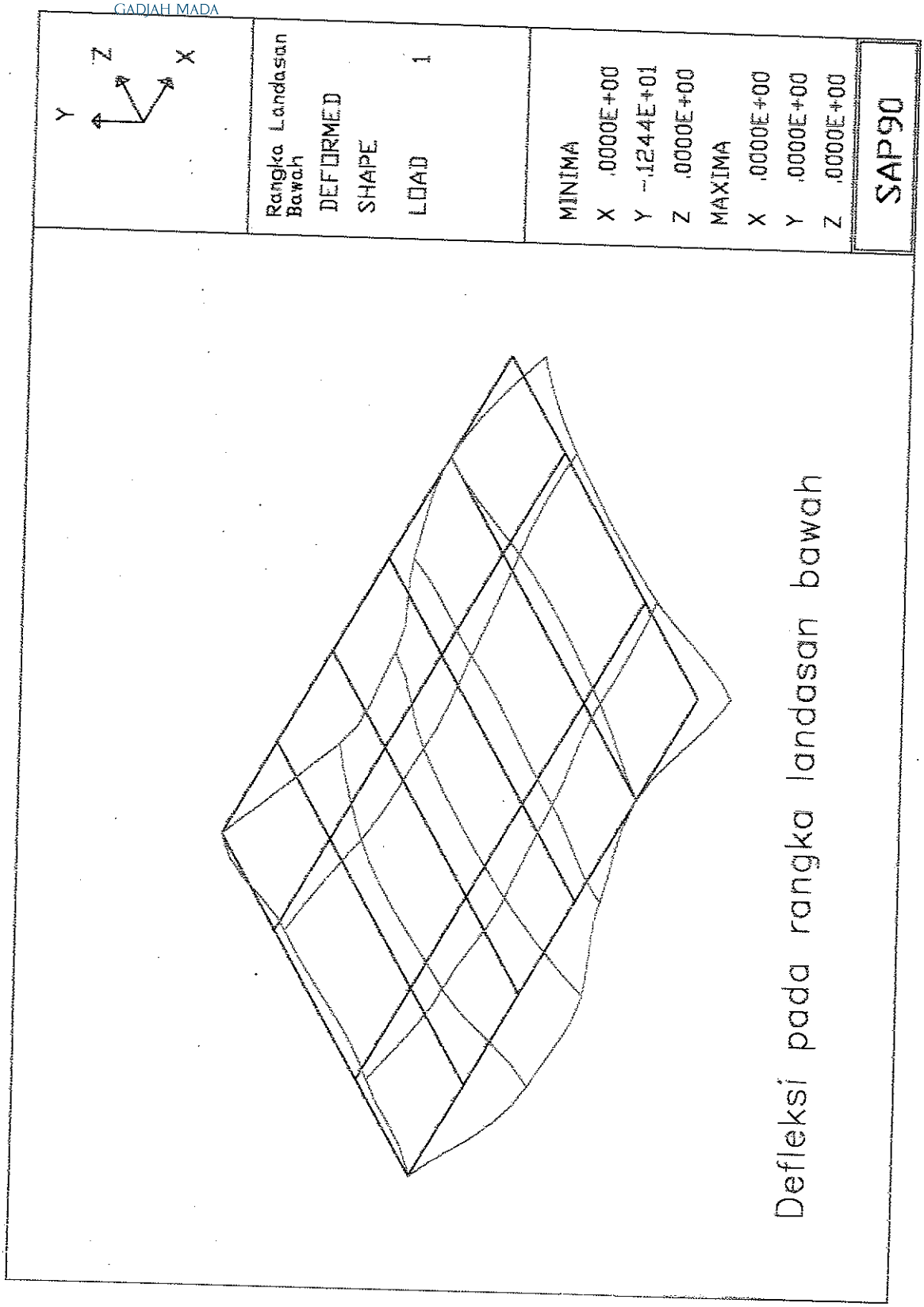

Defleksi pada rangka landasan bawah

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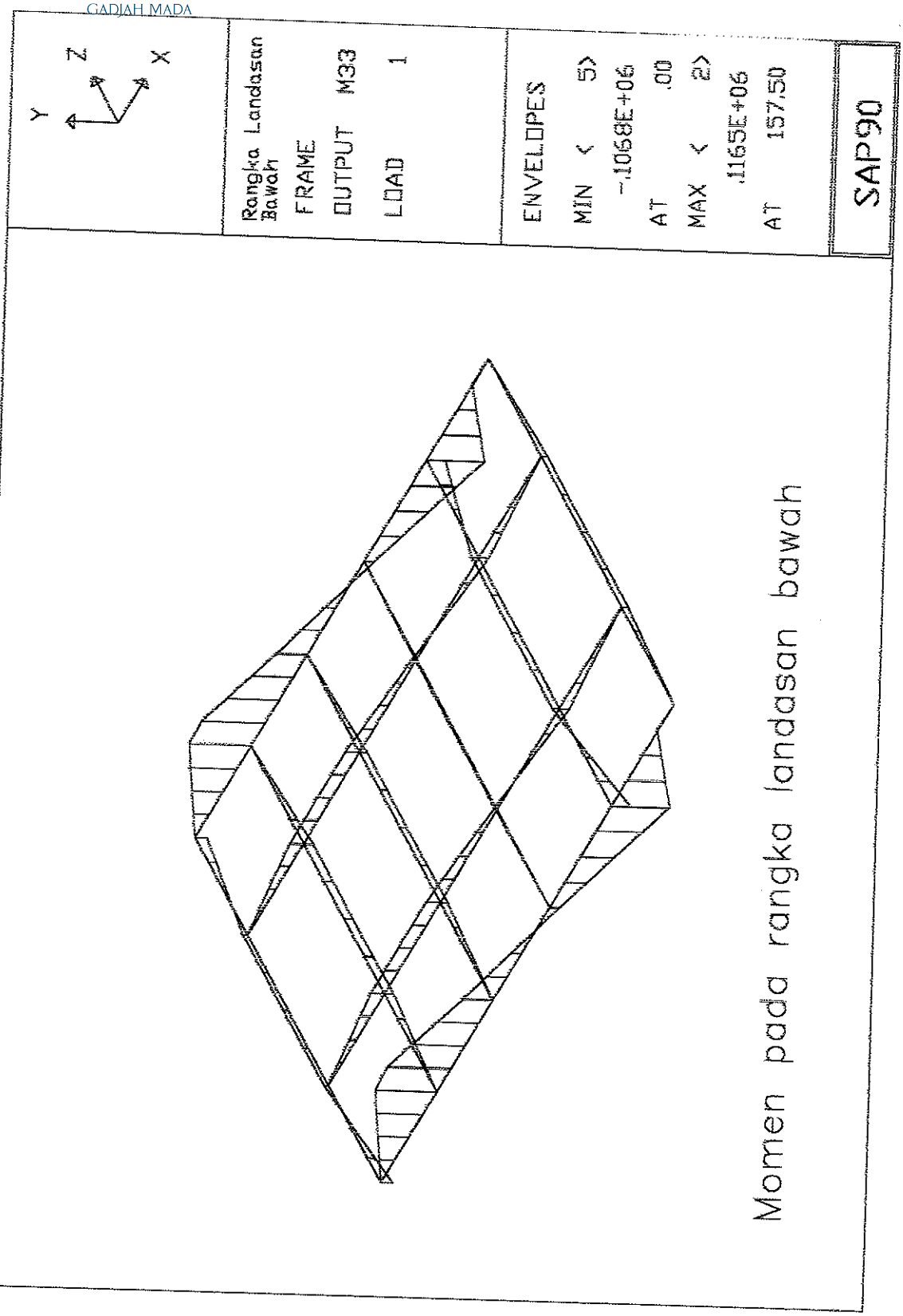

Momen pada rangka landasan bawah

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```
RANGKA UTAMA SEMI TRAILER
SYSTEM
L=1
JOINTS
C Merupakan nomor titik-titik nodal.
1   X=0      Y=550    Z=0
2   X=1150
3   X=2575
4   X=4000
5   X=4000   Y=0
6   X=7150
7   X=10300
8   X=12450
9   X=15600
10  X=0      Y=550    Z=2500
11  X=1150
12  X=2575
13  X=4000
14  X=4000   Y=0
15  X=7150
16  X=10300
17  X=12450
18  X=15600
19  X=0      Y=2150   Z=0
20  X=1150
21  X=2100
22  X=2575
23  X=4000
24  X=5725
25  X=7150
26  X=10300
27  X=12450
28  X=15600
29  X=15600  Y=2450
30  X=0      Y=2150   Z=2500
31  X=1150
32  X=2100
33  X=2575
34  X=4000
35  X=5725
36  X=7150
37  X=10300
38  X=12450
39  X=15600
40  X=15600  Y=2450
41  X=2100   Y=2150   Z=750
42  X=2575
43  X=4000
44  X=5725
45  X=7150
46  X=2100            Z=1750
47  X=2575
```

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```
48   X=4000
49   X=5725
50   X=7150
51   X=0       Y=550    Z=750
52   X=1150
53   X=2575
54   X=4000
55   X=4000   Y=0
56   X=5575
57   X=7150
58   X=8725
59   X=10300
60   X=11375
61   X=12450
62   X=13200
63   X=15600
64   X=0       Y=550    Z=1750
65   X=1150
66   X=2575
67   X=4000
68   X=4000   Y=0
69   X=5575
70   X=7150
71   X=8725
72   X=10300
73   X=11375
74   X=12450
75   X=13200
76   X=15600
77   X=1150   Y=550    Z=1250

RESTRAINS
1    76  1    R=0,0,0,0,0,0
77            R=1,1,1,0,1,0
60   73  13   R=0,1,1,0,1,0

FRAME
NM=7     NL=15    Y=-1
1    SH=C     T=100,40,7.5,4.7          E=20000 W=0.0080
2    SH=C     T=75,35,6.9,4.3           E=20000 W=0.0061
3    SH=C     T=130,44,8.1,4.8          E=20000 W=0.0100
4    SH=I     T=305,127,13.8,8.9,0,0    E=20000 W=0.0473
5    SH=I     T=254,126,12.5,15.1,0,0   E=20000 W=0.052
6    SH=I     T=152,90,9.1,11.8,0,0     E=20000 W=0.0257
7    SH=I     T=203,102,10.8,6.9,0,0    E=20000 W=0.0274
C BEBAN PADA RANGKA ATAS
1    PLD=10,-770,0
2    PLD=10,60,0
3    PLD=535,-320,0
4    PLD=1540,-220,0
5    PLD=10,-750,-117
6    PLD=3140,-646,-140
```

Perancangan Kendaraan Pengangkut Sedan Dengan Kapasitas Delapan Sedan
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```
C BEBAN PADA RANGKA BAWAH
7    PLD=670,-320,0
8    PLD=525,-220,0
9    PLD=50,441,-250
10   PLD=380,-400,0,2190,-337,0
11   PLD=1470,-286,0,
12   PLD=320,-320,0,2750,-220,0
C BEBAN PADA RANGKA ATAS
13   PLD=10,-750,117
14   PLD=3140,-646,140
C BEBAN PADA RANGKA BAWAH
15   PLD=50,-441,-250
C NOMOR ELEMEN
1    1    2    M=3 LP=1,0  NSL=7    G=1,8,9,9
2    2    3                NSL=0    G=1,8,9,9
3    3    4                NSL=8    G=1,8,9,9
4    4    5                NSL=0    G=1,8,9,9
5    5    6                NSL=0    G=1,8,9,9
6    6    7                NSL=10   G=1,8,9,9
7    7    8                NSL=11   G=1,8,9,9
8    8    9                NSL=12   G=1,8,9,9
17   19   20   M=1         NSL=1    G=1,10,11,11
18   20   21               NSL=0    G=1,10,11,11
19   21   22               NSL=2    G=1,10,11,11
20   22   23               NSL=3    G=1,10,11,11
21   23   24               NSL=4    G=1,10,11,11
22   24   25               NSL=0    G=1,10,11,11
23   25   26               NSL=5
33   36   37               NSL=13
24   26   27               NSL=0    G=1,10,11,11
25   27   28               NSL=6
35   38   39               NSL=14
26   28   29   M=3         NSL=0    G=1,10,11,11
37   1    19   M=1         NSL=0    G=1,2,1,1
41   3    22               NSL=0    G=1,2,1,1
45   6    25               NSL=0    G=2,2,1,1
51   9    28   M=3         NSL=0
38   2    19   M=1         NSL=0    G=1,16,9,11
40   2    22               NSL=0    G=1,16,9,11
42   3    23               NSL=0    G=1,16,9,11
44   6    23               NSL=0    G=1,16,9,11
46   6    26               NSL=0    G=1,16,9,11
48   8    26               NSL=0    G=1,16,9,11
50   8    28               NSL=0    G=1,16,9,11
52   4    6                NSL=0    G=1,16,9,9
53   10   30               NSL=0    G=1,2,1,1
57   12   33               NSL=0    G=1,2,1,1
61   15   36               NSL=0    G=2,2,1,1
67   18   39   M=3         NSL=0
69   21   41   M=2 LP=3,0  NSL=0    G=4,1,1,1
74   41   46               NSL=0    G=4,1,1,1
79   32   46               NSL=0    G=4,1,1,1
```

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84	41	42	M=1 LP=1,0	NSL=0	G=3,1,1,1
88	46	47		NSL=0	G=3,1,1,1
92	29	40	M=3 LP=3,0	NSL=0	
93	1	51	M=6	NSL=0	G=2,1,1,1
96	4	54		NSL=0	
97	5	55		NSL=9	
98	6	57		NSL=0	G=1,3,3,6
99	7	59	M=7	NSL=0	G=1,1,1,2
102	51	64	M=5	NSL=0	
103	52	77		NSL=0	
104	65	77		NSL=0	
105	53	66		NSL=0	G=10,1,1,1
116	10	64	M=6	NSL=0	G=2,1,1,1
119	13	67		NSL=0	
120	14	68		NSL=15	
121	15	70		NSL=0	G=1,3,3,6
122	16	72	M=7	NSL=0	G=1,1,1,2
125	51	52	M=4 LP=1,0	NSL=0	G=11,1,1,1
137	64	65		NSL=0	G=11,1,1,1

FINITE ELEMENT ANALYSIS OF STRUCTURES
PROGRAM:SAP90/FILE:Rangka utama semi trailer SDP
RANGKA UTAMA SE

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G E N E R A T E D J O I N T C O O R D I N A T E S

JOINT	X	Y	Z
1	.000	550.000	.000
2	1150.000	550.000	.000
3	2575.000	550.000	.000
4	4000.000	550.000	.000
5	4000.000	.000	.000
6	7150.000	.000	.000
7	10300.000	.000	.000
8	12450.000	.000	.000
9	15600.000	.000	.000
10	.000	550.000	2500.000
11	1150.000	550.000	2500.000
12	2575.000	550.000	2500.000
13	4000.000	550.000	2500.000
14	4000.000	.000	2500.000
15	7150.000	.000	2500.000
16	10300.000	.000	2500.000
17	12450.000	.000	2500.000
18	15600.000	.000	2500.000
19	.000	2150.000	.000
20	1150.000	2150.000	.000
21	2100.000	2150.000	.000
22	2575.000	2150.000	.000
23	4000.000	2150.000	.000
24	5725.000	2150.000	.000
25	7150.000	2150.000	.000
26	10300.000	2150.000	.000
27	12450.000	2150.000	.000
28	15600.000	2150.000	.000
29	15600.000	2450.000	.000
30	.000	2150.000	2500.000
31	1150.000	2150.000	2500.000
32	2100.000	2150.000	2500.000
33	2575.000	2150.000	2500.000
34	4000.000	2150.000	2500.000
35	5725.000	2150.000	2500.000
36	7150.000	2150.000	2500.000
37	10300.000	2150.000	2500.000
38	12450.000	2150.000	2500.000
39	15600.000	2150.000	2500.000
40	15600.000	2450.000	2500.000
41	2100.000	2150.000	750.000
42	2575.000	2150.000	750.000
43	4000.000	2150.000	750.000
44	5725.000	2150.000	750.000
45	7150.000	2150.000	750.000
46	2100.000	2150.000	1750.000
47	2575.000	2150.000	1750.000
48	4000.000	2150.000	1750.000
49	5725.000	2150.000	1750.000
50	7150.000	2150.000	1750.000
51	.000	550.000	750.000
52	1150.000	550.000	750.000
53	2575.000	550.000	750.000
54	4000.000	550.000	750.000
55	4000.000	.000	750.000
56	5575.000	.000	750.000
57	7150.000	.000	750.000
58	8725.000	.000	750.000
59	10300.000	.000	750.000
60	11375.000	.000	750.000
61	12450.000	.000	750.000
62	13200.000	.000	750.000
63	15600.000	.000	750.000
64	.000	550.000	1750.000

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JOINT	X	Y	Z
65	1150.000	550.000	1750.000
66	25[illegible]	[illegible]	[illegible]
67	4000.000	550.000	1750.000
68	4000.000	.000	1750.000
69	5575.000	.000	1750.000
70	7150.000	.000	1750.000
71	8725.000	.000	1750.000
72	10300.000	.000	1750.000
73	11375.000	.000	1750.000
74	12450.000	.000	1750.000
75	13200.000	.000	1750.000
76	15600.000	.000	1750.000
77	1150.000	550.000	1250.000

R E S T R A I N T D A T A

JOINT	RX	RY	RZ	RXX	RYY	RZZ
60	0	1	1	0	1	0
73	0	1	1	0	1	0
77	1	1	1	0	1	0

T O T A L W E I G H T S A N D M A S S E S

PROP	WEIGHT	MASS
1	918.9623	.0000
2	76.2500	.0000
3	397.0000	.0000
4	1527.7900	.0000
5	676.0000	.0000
6	269.8500	.0000
7	82.2000	.0000
TOTAL	3948.0523	.0000

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FINITE ELEMENT ANALYSIS OF STRUCTURES
PROGRAM:SAP90/FILE:Rangka utama semi trailer T2T
RANGKA UTAMA SE

F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
1	1	-53.38						-27.05
			.0	121.43	-17907.29	-19.62	11804.98	
			670.0	-205.27	61206.25	-19.62	-1343.30	
			1150.0	-210.07	-38474.17	-19.62	-10762.84	
9	1	-53.38						27.05
			.0	121.43	-17907.29	19.62	-11804.98	
			670.0	-205.27	61206.25	19.62	1343.30	
			1150.0	-210.07	-38474.17	19.62	10762.84	
2	1	441.06						81.15
			.0	18.36	-25328.37	-11.50	8091.00	
			1425.0	4.11	-9322.31	-11.50	-8296.88	
10	1	441.06						-81.15
			.0	18.36	-25328.37	11.50	-8091.00	
			1425.0	4.11	-9322.31	11.50	8296.88	
3	1	1115.00						86.33
			.0	209.33	-56220.02	-11.19	8147.24	
			525.0	-15.92	52299.25	-11.19	2274.03	
			1425.0	-24.92	33919.97	-11.19	-7794.18	
11	1	1115.00						-86.33
			.0	209.33	-56220.02	11.19	-8147.24	
			525.0	-15.92	52299.25	11.19	-2274.03	
			1425.0	-24.92	33919.97	11.19	7794.18	
4	1	426.11						181.30
			.0	-90.30	43778.04	-5.24	1364.54	
			550.0	-90.30	-5885.63	-5.24	-1516.78	
12	1	426.11						-181.30
			.0	-90.30	43778.04	5.24	-1364.54	
			550.0	-90.30	-5885.63	5.24	1516.78	
5	1	341.90						-2.64
			.0	3.34	-5114.57	1.83	-2960.28	
			334.4	.00	-4555.52	1.83	-2346.90	
			3150.0	-28.16	-44194.07	1.83	2817.92	
13	1	341.90						2.64
			.0	3.34	-5114.57	-1.83	2960.28	
			334.4	.00	-4555.52	-1.83	2346.90	
			3150.0	-28.16	-44194.07	-1.83	-2817.92	
6	1	-1127.42						-65.25
			.0	454.48	-133200.63	1.09	-2035.44	
			380.0	50.68	38778.62	1.09	-1621.71	
			2190.0	-304.42	114117.81	1.09	348.89	
			3150.0	-314.02	-182734.63	1.09	1394.06	
14	1	-1127.42						65.25
			.0	454.48	-133200.63	-1.09	2035.44	
			380.0	50.68	38778.62	-1.09	1621.71	
			2190.0	-304.42	114117.81	-1.09	-348.89	
			3150.0	-314.02	-182734.63	-1.09	-1394.06	
7	1	-1149.92						-12.41
			.0	122.05	-132263.81	.02	-383.09	
			1470.0	-178.65	36343.39	.02	-353.26	
			2150.0	-185.45	-87449.75	.02	-339.46	

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ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL
15	1	-1149.92	.0	122.05	-132263.81	-.02	383.09	12.41
			1470.0	-178.65	36343.39	-.02	353.26	
			2150.0	-185.45	-87449.75	-.02	339.46	
8	1	30.04	.0	356.81	-120603.07	-.43	697.85	79.07
			320.0	33.61	-6934.47	-.43	558.68	
			2750.0	-210.69	45219.20	-.43	-498.11	
			3150.0	-214.69	-39853.46	-.43	-672.06	
16	1	30.04	.0	356.81	-120603.07	.43	-697.85	-79.07
			320.0	33.61	-6934.47	.43	-558.68	
			2750.0	-210.69	45219.20	.43	498.11	
			3150.0	-214.69	-39853.46	.43	672.06	
17	1	-12.26	.0	772.98	-6725.85	-1.33	1322.10	86.24
			1150.0	-6.22	-886.60	-1.33	-206.12	
27	1	-12.26	.0	772.98	-6725.85	1.33	-1322.10	-86.24
			1150.0	-6.22	-886.60	1.33	206.12	
18	1	-5.19	.0	-15.11	3307.53	-5.89	-114.35	33.37
			950.0	-22.71	-14660.37	-5.89	-5711.17	
28	1	-5.19	.0	-15.11	3307.53	5.89	114.35	-33.37
			950.0	-22.71	-14660.37	5.89	5711.17	
19	1	-5.66	.0	-33.37	-14641.92	15.70	-5051.00	20.50
			10.0	26.55	-14976.02	15.70	-4893.99	
			475.0	22.83	-3496.96	15.70	2405.90	
29	1	-5.66	.0	-33.37	-14641.92	-15.70	5051.00	-20.50
			10.0	26.55	-14976.02	-15.70	4893.99	
			475.0	22.83	-3496.96	-15.70	-2405.90	
20	1	-632.26	.0	200.20	-48200.75	.19	-103.07	25.67
			535.0	-124.08	57760.54	.19	-1.82	
			1425.0	-131.20	-55839.00	.19	166.60	
30	1	-632.26	.0	200.20	-48200.75	-.19	103.07	-25.67
			535.0	-124.08	57760.54	-.19	1.82	
			1425.0	-131.20	-55839.00	-.19	-166.60	
21	1	-1045.97	.0	131.87	-94784.63	.14	-143.19	-86.52
			1540.0	-100.45	98805.37	.14	70.37	
			1725.0	-101.93	80085.40	.14	96.02	
31	1	-1045.97	.0	131.87	-94784.63	-.14	143.19	86.52
			1540.0	-100.45	98805.37	-.14	-70.37	
			1725.0	-101.93	80085.40	-.14	-96.02	
22	1	-1048.67	.0	-91.54	80106.95	-2.66	1212.43	101.72
			1425.0	-102.94	-58458.83	-2.66	-2582.48	

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ELT ID	LOAD COND	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL
32	1	-1048.57	.0	-91.54	80106.95	2.66	-1212.43	-101.72
			1425.0	-102.94	-58458.83	2.66	2582.48	
23	1	-1038.21	.0	765.92	-26536.98	118.10	-3109.21	-56.68
			3150.0	-9.28	-8565.93	1.10	1524.29	
33	1	-1038.21	.0	765.92	-26536.98	-118.10	3109.21	56.68
			3150.0	-9.28	-8565.93	-1.10	-1524.29	
24	1	1459.27	.0	7.25	-5158.38	.28	928.26	1.54
			906.0	.00	-1874.84	.28	1180.32	
			2150.0	-9.95	-8064.70	.28	1526.40	
34	1	1459.27	.0	7.25	-5158.38	-.28	-928.26	-1.54
			906.0	.00	-1874.84	-.28	-1180.32	
			2150.0	-9.95	-8064.70	-.28	-1526.40	
25	1	1444.95	.0	19.54	-19040.79	-.77	1545.03	60.45
			2442.3	.00	4818.15	-.77	-341.34	
			3140.0	-651.58	2864.74	-140.77	-881.57	
			3150.0	-651.66	-3645.32	-140.77	-2287.96	
35	1	1444.95	.0	19.54	-19040.79	.77	-1545.03	-60.45
			2442.3	.00	4818.15	.77	341.34	
			3140.0	-651.58	2864.74	140.77	881.57	
			3150.0	-651.66	-3645.32	140.77	2287.96	
26	1	-14.00	.0	.00	.00	-131.65	12971.90	268.53
			300.0	.00	.00	-131.65	-26524.35	
36	1	-14.00	.0	.00	.00	131.65	-12971.90	-268.53
			300.0	.00	.00	131.65	26524.35	
37	1	-786.22	.0	-16.96	17442.77	.60	714.50	-86.93
			1600.0	-16.96	-9688.14	.60	1673.48	
39	1	2.50	.0	7.07	-7112.02	-4.56	7247.14	-91.76
			1600.0	7.07	4194.13	-4.56	-52.87	
41	1	451.41	.0	-39.51	30955.84	-2.25	4586.38	-26.68
			1600.0	-39.51	-32253.54	-2.25	978.49	
43	1	669.25	.0	1.05	-10332.68	6.95	-3796.01	-24.29
			1600.0	1.05	-8650.85	6.95	7330.36	
45	1	-906.58	.0	10.79	8705.39	3.51	-2450.15	27.80
			2150.0	10.79	31902.06	3.51	5102.72	
47	1	-1251.78	.0	36.95	-50384.98	-1.47	2435.70	27.67
			2150.0	36.95	29052.49	-1.47	-718.26	

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ELT ID	LOAD COND	AXIAL FORCE	DIST ENDT	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL
49	1	-38.09	.0	-14.32	19813.59	-1.05	2317.66	-18.63
			2150.0	-14.32	-10976.09	-1.05	58.91	
51	1	308.28	.0	23.46	-38768.91	8.77	-7359.06	-46.66
			2150.0	23.46	11661.00	8.77	11506.86	
38	1	-3.59	.0	-1.40	-3351.54	-1.93	1789.67	-76.61
			298.9	.00	-3560.14	-1.93	1213.28	
			1970.4	7.80	2962.29	-1.93	-2009.75	
54	1	-3.59	.0	-1.40	-3351.54	1.93	-1789.67	76.61
			298.9	.00	-3560.14	1.93	-1213.28	
			1970.4	7.80	2962.29	1.93	2009.75	
40	1	-881.80	.0	1.00	-2378.89	-4.56	7740.88	55.46
			187.3	.00	-2285.54	-4.56	6886.14	
			2142.6	-10.40	-12456.02	-4.56	-2034.92	
56	1	-881.80	.0	1.00	-2378.89	4.56	-7740.88	-55.46
			187.3	.00	-2285.54	4.56	-6886.14	
			2142.6	-10.40	-12456.02	4.56	2034.92	
42	1	-1059.53	.0	-10.13	16293.94	-.93	3384.47	39.61
			2142.6	-21.53	-17614.30	-.93	1393.94	
58	1	-1059.53	.0	-10.13	16293.94	.93	-3384.47	-39.61
			2142.6	-21.53	-17614.30	.93	-1393.94	
44	1	-372.39	.0	-24.04	30926.16	.32	22.51	-16.34
			3638.0	.00	-12799.05	.32	1184.32	
			3813.8	1.16	-12696.92	.32	1240.47	
60	1	-372.39	.0	-24.04	30926.16	-.32	-22.51	16.34
			3638.0	.00	-12799.05	-.32	-1184.32	
			3813.8	1.16	-12696.92	-.32	-1240.47	
46	1	2637.28	.0	.05	21420.77	.58	-2077.71	-7.26
			3813.8	-25.15	-26437.47	.58	143.06	
62	1	2637.28	.0	.05	21420.77	-.58	2077.71	7.26
			3813.8	-25.15	-26437.47	-.58	-143.06	
48	1	-415.23	.0	-14.64	19164.79	.06	792.03	-7.93
			2588.4	.00	214.35	.06	955.98	
			3040.6	2.56	792.53	.06	984.61	
64	1	-415.23	.0	-14.64	19164.79	-.06	-792.03	7.93
			2588.4	.00	214.35	-.06	-955.98	
			3040.6	2.56	792.53	-.06	-984.61	

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ELT ID	LOAD COND	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE	1-3 PLANE	AXIAL
50	1	-1777.39	.0	11.94	-5511.73	.34	1111.75	47.99
			1807.5	.00	5282.35	.34	1732.38	
			3813.8	-13.26	-8015.68	.34	2421.23	
66	1	-1777.39	.0	11.94	-5511.73	-.34	-1111.75	-47.99
			1807.5	.00	5282.35	-.34	-1732.38	
			3813.8	-13.26	-8015.68	-.34	-2421.23	
52	1	987.45	.0	3.84	1222.52	-.14	883.76	2.02
			487.3	.00	2158.08	-.14	814.92	
			3197.7	-21.36	-26788.80	-.14	431.96	
68	1	987.45	.0	3.84	1222.52	.14	-883.76	-2.02
			487.3	.00	2158.08	.14	-814.92	
			3197.7	-21.36	-26788.80	.14	-431.96	
53	1	-786.22	.0	-16.96	17442.77	-.60	-714.50	86.93
			1600.0	-16.96	-9688.14	-.60	-1673.48	
55	1	2.50	.0	7.07	-7112.02	4.56	-7247.14	91.76
			1600.0	7.07	4194.13	4.56	52.87	
57	1	451.41	.0	-39.51	30955.84	2.25	-4586.38	26.68
			1600.0	-39.51	-32253.54	2.25	-978.49	
59	1	669.25	.0	1.05	-10332.68	-6.95	3796.01	24.29
			1600.0	1.05	-8650.85	-6.95	-7330.36	
61	1	-906.58	.0	10.79	8705.39	-3.51	2450.15	-27.80
			2150.0	10.79	31902.06	-3.51	-5102.72	
63	1	-1251.78	.0	36.95	-50384.98	1.47	-2435.70	-27.67
			2150.0	36.95	29052.49	1.47	718.26	
65	1	-38.09	.0	-14.32	19813.59	1.05	-2317.66	18.63
			2150.0	-14.32	-10976.09	1.05	-58.91	
67	1	308.28	.0	23.46	-38768.91	-8.77	7359.06	46.66
			2150.0	23.46	11661.00	-8.77	-11506.86	
69	1	21.59	.0	-10.66	12.87	-.46	660.17	-18.45
			750.0	-6.09	-6266.65	-.46	311.47	
70	1	-8.69	.0	-11.61	-509.41	2.89	-1140.83	-5.78
			750.0	-7.03	-7499.64	2.89	1024.30	
71	1	-6.39	.0	-37.54	9222.65	.60	-216.24	-16.44
			750.0	-32.96	-17213.37	.60	236.20	
72	1	-2.80	.0	10.39	-188.24	-2.70	1116.41	-21.55
			750.0	14.97	9321.93	-2.70	-904.90	

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ELT ID	LOAD COND	AXIAL FORCE	DIST END	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL
73	1	117.25	.0	-29.11	5261.12	-.33	-498.93	-19.79
			750.0	-24.54	-14858.90	-.33	-746.49	
74	1	23.56	.0	-3.05	-6276.59	.00	7.93	.00
			500.0	.00	-7039.09	.00	7.93	
			1000.0	3.05	-6276.59	.00	7.93	
75	1	-10.29	.0	-3.05	-7515.41	.00	97.82	.00
			500.0	.00	-8277.91	.00	97.82	
			1000.0	3.05	-7515.41	.00	97.82	
76	1	-6.93	.0	-3.05	-17129.51	.00	47.78	.00
			500.0	.00	-17892.01	.00	47.78	
			1000.0	3.05	-17129.51	.00	47.78	
77	1	-3.40	.0	-3.05	9199.62	.00	-142.91	.00
			500.0	.00	8437.12	.00	-142.91	
			1000.0	3.05	9199.62	.00	-142.91	
78	1	118.02	.0	-3.05	-14794.74	.00	-178.68	.00
			500.0	.00	-15557.24	.00	-178.68	
			1000.0	3.05	-14794.74	.00	-178.68	
79	1	21.59	.0	10.66	-12.87	-.46	660.17	18.45
			750.0	6.09	6266.65	-.46	311.47	
80	1	-8.69	.0	11.61	509.41	2.89	-1140.83	5.78
81	1	-6.39	.0	37.54	-9222.65	.60	-216.24	16.44
			750.0	32.96	17213.37	.60	236.20	
82	1	-2.80	.0	-10.39	188.24	-2.70	1116.41	21.55
			750.0	-14.97	-9321.93	-2.70	-904.90	
83	1	117.25	.0	29.11	-5261.12	-.33	-498.93	19.79
			750.0	24.54	14858.90	-.33	-746.49	
84	1	.46	.0	3.04	-18.45	1.97	-303.55	9.94
			379.4	.00	557.32	1.97	442.88	
			475.0	-.76	520.77	1.97	630.96	
85	1	-2.42	.0	3.22	514.99	.37	-295.52	25.71
			402.3	.00	1162.21	.37	-145.83	
			1425.0	-8.18	-3021.85	.37	234.77	
86	1	-3.03	.0	21.73	-3038.29	-.16	46.35	-58.16
			1725.0	7.93	22540.94	-.16	-237.61	
87	1	-.33	.0	-10.09	22519.39	-.77	524.39	64.16
			1425.0	-21.49	19.79	-.77	-567.81	

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ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
88		-.45						-9.94
			.0	3.04	-18.45	-1.97	303.55	
			379.4	.00	557.32	-1.97	-442.88	
			475.0	-.76	520.77	-1.97	-630.96	
89								
	1	-2.42						-25.71
			.0	3.22	514.99	-.37	295.52	
			402.3	.00	1162.21	-.37	145.83	
			1425.0	-8.18	-3021.85	-.37	-234.77	
90								
	1	-3.03						58.16
			.0	21.73	-3038.29	.16	-46.35	
			1725.0	7.93	22540.94	.16	237.61	
91								
	1	-.33						-64.16
			.0	-10.09	22519.39	.77	-524.39	
			1425.0	-21.49	19.79	.77	567.81	
92								
	1	131.65						.00
			.0	-12.50	-26524.35	.00	268.53	
			1250.0	.00	-34336.85	.00	268.53	
			2500.0	12.50	-26524.35	.00	268.53	
93								
	1	-19.02						464.52
			.0	914.05	-687.45	-70.34	11891.90	
			750.0	933.32	692075.33	-70.34	-40864.09	
94								
	1	-2.93						-303.35
			.0	905.20	-14670.79	-83.78	23070.24	
			750.0	924.47	671455.27	-83.78	-39761.09	
95								
	1	-2.87						-352.08
			.0	549.47	-7145.32	-82.06	18692.19	
			750.0	568.75	412185.76	-82.06	-42851.03	
96								
	1	12.76						-747.91
			.0	-35.06	5396.90	-49.41	8870.71	
			750.0	-15.78	-13669.12	-49.41	-28187.09	
97								
	1	7.07						-771.06
			.0	-420.02	1519.42	251.60	-3141.58	
			50.0	22.27	-19449.29	1.60	9438.50	
			750.0	40.26	2434.21	1.60	10559.53	
98								
	1	3.81						1165.44
			.0	2.16	3591.55	39.54	-7028.41	
			750.0	21.44	12441.44	39.54	22627.44	
101								
	1	9.21						-1084.56
			.0	-82.84	7438.12	-6.59	718.73	
			750.0	-63.57	-47466.66	-6.59	-4222.27	
99								
	1	-2.54						-85.84
			.0	1696.45	-2488.54	14.45	-1804.82	
			750.0	1717.00	1277554.85	14.45	9032.83	
100								
	1	-1.10						-313.34
			.0	1915.70	-3641.16	-13.42	1392.69	
			750.0	1936.25	1440840.64	-13.42	-8672.57	
102								
	1	-87.88						.00
			.0	-26.00	692595.61	.00	-7627.03	
			500.0	.00	686095.61	.00	-7627.03	
			1000.0	26.00	692595.61	.00	-7627.03	
103								
	1	24.66						.00
			.0	2866.49	670347.33	-250.00	41784.11	
			500.0	2892.49	2110091.69	-250.00	-83215.89	

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ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL FORCE
104		24.66						.00
			.0	-2866.49	-670347.33	-250.00	41784.11	
			500.0	-2892.49	-2110091.69	-250.00	-83215.89	
105								
	1	15.18						.00
			.0	-26.00	412520.41	.00	-4909.32	
			500.0	.00	406020.41	.00	-4909.32	
			1000.0	26.00	412520.41	.00	-4909.32	
106								
	1	26.38						.00
			.0	-26.00	-9801.30	.00	-9519.34	
			500.0	.00	-16301.30	.00	-9519.34	
			1000.0	26.00	-9801.30	.00	-9519.34	
107								
	1	20.34						.00
			.0	-26.00	4091.72	.00	4875.29	
			500.0	.00	-2408.28	.00	4875.29	
			1000.0	26.00	4091.72	.00	4875.29	
108								
	1	2.35						.00
			.0	-26.00	8.94	.00	-2083.81	
			500.0	.00	-6491.06	.00	-2083.81	
			1000.0	26.00	8.94	.00	-2083.81	
109								
	1	4.41						.00
			.0	-26.00	12428.35	.00	6637.59	
			500.0	.00	5928.35	.00	6637.59	
			1000.0	26.00	12428.35	.00	6637.59	
110								
	1	-5.72						.00
			.0	-26.00	697.51	.00	-1620.27	
			500.0	.00	-5802.49	.00	-1620.27	
			1000.0	26.00	697.51	.00	-1620.27	
111								
	1	2.94						.00
			.0	-26.00	1275852.23	.00	2300.79	
			500.0	.00	1269352.23	.00	2300.79	
			1000.0	26.00	1275852.23	.00	2300.79	
112								
	1	.00						.00
			.0	-26.00	2151.75	.00	.00	
			500.0	.00	-4348.25	.00	.00	
			1000.0	26.00	2151.75	.00	.00	
113								
	1	-1.75						.00
			.0	-26.00	1438065.33	.00	-1649.66	
			500.0	.00	1431565.33	.00	-1649.66	
			1000.0	26.00	1438065.33	.00	-1649.66	
114								
	1	4.27						.00
			.0	-26.00	1617.56	.00	680.76	
			500.0	.00	-4882.44	.00	680.76	
			1000.0	26.00	1617.56	.00	680.76	
115								
	1	10.17						.00
			.0	-26.00	-47449.20	.00	-2357.42	
			500.0	.00	-53949.20	.00	-2357.42	
			1000.0	26.00	-47449.20	.00	-2357.42	
116								
	1	-19.02						-464.52
			.0	-914.05	687.45	-70.34	11891.90	
			750.0	-933.32	-692075.33	-70.34	-40864.09	
117								
	1	-2.93						303.35
			.0	-905.20	14670.79	-83.78	23070.24	
			750.0	-924.47	-671455.27	-83.78	-39761.09	

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ELT ID	LOAD COND	AXIAL FORCE	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	1-3 PLANE SHEAR	1-3 PLANE MOMENT	AXIAL TORQ
118			.0	-549.47	7145.32	-82.06	18692.19	352.08
			750.0	-568.75	-412185.76	-82.06	-42851.03	
119								
	1	12.76						747.91
			.0	35.06	-5396.90	-49.41	8870.71	
			750.0	15.78	13669.12	-49.41	-28187.09	
120								
	1	7.07						771.06
			.0	420.02	-1519.42	251.60	-3141.58	
			50.0	-22.27	19449.29	1.60	9438.50	
			750.0	-40.26	-2434.21	1.60	10559.53	
121								
	1	3.81						-1165.44
			.0	-2.16	-3591.55	39.54	-7028.41	
			750.0	-21.44	-12441.44	39.54	22627.44	
124								
	1	9.21						1084.56
			.0	82.84	-7438.12	-6.59	718.73	
			750.0	63.57	47466.66	-6.59	-4222.27	
122								
	1	-2.54						85.84
			.0	-1696.45	2488.54	14.45	-1804.82	
			750.0	-1717.00	-1277554.85	14.45	9032.83	
123								
	1	-1.10						313.34
			.0	-1915.70	3641.16	-13.42	1392.69	
			750.0	-1936.25	-1440840.64	-13.42	-8672.57	
125								
	1	70.34						-520.28
			.0	-959.32	464.52	-68.86	33237.06	
			1150.0	-1013.72	-1134031.99	-68.86	-45948.02	
126								
	1	-95.88						587.66
			.0	928.30	-1134335.34	-41.27	35597.18	
			1425.0	860.90	140468.26	-41.27	-23209.29	
127								
	1	-13.83						253.00
			.0	266.15	140116.19	-23.21	14732.41	
			1425.0	198.75	471358.75	-23.21	-18345.36	
128								
	1	175.53						322.38
			.0	-35.58	470610.84	-9.59	3614.82	
			550.0	-35.58	451039.38	-9.59	-1659.73	
129								
	1	33.98						2.21
			.0	96.26	450268.32	3.68	-5361.85	
			1575.0	21.76	543213.11	3.68	427.30	
130								
	1	33.98						-6.73
			.0	-4.24	543213.11	6.03	-1656.51	
			1575.0	-78.73	477874.35	6.03	7840.66	
131								
	1	-5.56						6.36
			.0	-126.17	479039.79	6.63	-8149.18	
			1575.0	-200.67	221653.63	6.63	2293.72	
132								
	1	-5.56						-691.16
			.0	-226.67	221653.63	.91	673.45	
			1575.0	-301.17	-194016.08	.91	2106.88	
133								
	1	-20.01						1011.47
			.0	-2044.17	-194101.93	6.38	-4625.16	
			1075.0	-2095.01	-2418910.43	6.38	2234.92	
134								
	1	-20.01						-1140.29
			.0	2150.52	-2418910.43	-4.59	1609.29	
			1075.0	2099.68	-134427.28	-4.59	-3323.08	

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ELT LOAD     AXIAL DIST            1-2 PLANE                  1-3 PLANE      AXIAL
 ID COND     FORCE ENDI        SHEAR        MOMENT        SHEAR       MOMENT      TORQ
135 ---------------------------------------------------------------------------------
                -6.59                                                          1635.02
                   .0          137.43   -134740.61        -5.24      3699.83
                750.0          101.95    -44974.15        -5.24      -229.68
136 ---------------------------------------------------------------------------------
      1    -6.59
                                                                              17.45
                   .0           75.95    -44974.15         -.96       451.08
               1605.7             .00     16004.43         -.96     -1098.41
               2400.0          -37.57      1084.56         -.96     -1864.84
137 ---------------------------------------------------------------------------------
      1    70.34
                                                                             520.28
                   .0         -959.32       464.52        68.86    -33237.06
               1150.0        -1013.72  -1134031.99        68.86     45948.02
138 ---------------------------------------------------------------------------------
      1   -95.88
                                                                            -587.66
                   .0          928.30  -1134335.34        41.27    -35597.18
               1425.0          860.90    140468.26        41.27     23209.29
139 ---------------------------------------------------------------------------------
      1   -13.83
                                                                            -253.00
                   .0          266.15    140116.19        23.21    -14732.41
               1425.0          198.75    471358.75        23.21     18345.36
140 ---------------------------------------------------------------------------------
      1   175.53
                                                                            -322.38
                   .0          -35.58    470610.84         9.59     -3614.82
                550.0          -35.58    451039.38         9.59      1659.73
141 ---------------------------------------------------------------------------------
      1    33.98
                                                                              -2.21
                   .0           96.26    450268.32        -3.68      5361.85
               1575.0           21.76    543213.11        -3.68      -427.30
142 ---------------------------------------------------------------------------------
      1    33.98
                                                                               6.73
                   .0           -4.24    543213.11        -6.03      1656.51
               1575.0          -78.73    477874.35        -6.03     -7840.66
143 ---------------------------------------------------------------------------------
      1    -5.56
                                                                              -6.36
                   .0         -126.17    479039.79        -6.63      8149.18
               1575.0         -200.67    221653.63        -6.63     -2293.72
144 ---------------------------------------------------------------------------------
      1    -5.56
                                                                             691.16
                   .0         -226.67    221653.63         -.91      -673.45
               1575.0         -301.17   -194016.08         -.91     -2106.88
145 ---------------------------------------------------------------------------------
      1   -20.01
                                                                           -1011.47
                   .0        -2044.17   -194101.93        -6.38      4625.16
               1075.0        -2095.01  -2418910.43        -6.38     -2234.92
146 ---------------------------------------------------------------------------------
      1   -20.01
                                                                            1140.29
                   .0         2150.52  -2418910.43         4.59     -1609.29
               1075.0         2099.68   -134427.28         4.59      3323.08
147 ---------------------------------------------------------------------------------
      1    -6.59
                                                                           -1635.02
                   .0          137.43   -134740.61         5.24     -3699.83
                750.0          101.95    -44974.15         5.24       229.68
148 ---------------------------------------------------------------------------------
      1    -6.59
                                                                             -17.45
                   .0           75.95    -44974.15          .96      -451.08
               1605.7             .00     16004.43          .96      1098.41
               2400.0          -37.57      1084.56          .96      1864.84
```

FINITE ELEMENT ANALYSIS OF STRUCTURES
PROGRAM:SAP90/FILE:Rangka utama semi trailer SOI
RANGKA UTAMA SE

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J O I N T D I S P L A C E M E N T S

LOAD CONDITION 1 - DISPLACEMENTS "U" AND ROTATIONS "R"

JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
1	-.398271	-.830622	.000554	-.001486	.000528	-.000551
2	-.400709	-1.270381	-.000059	-.001712	.000401	-.000238
3	-.375749	-1.899589	-.000024	-.000871	.000432	-.000582
4	-.312650	-2.509372	-.000249	.000024	.000378	.000012
5	-.232113	-2.518679	-.000159	.000033	-.000347	.000173
6	-.189343	-2.721504	-.000061	-.000027	-.000299	-.000623
7	-.330379	-1.604617	.000016	-.001523	-.000084	.000815
8	-.428562	-1.827905	.000019	-.001717	.000081	-.000496
9	-.424804	-3.280035	-.000146	.000095	.000072	.000109
10	-.398271	-.830622	-.000554	.001486	-.000528	-.000551
11	-.400709	-1.270381	.000059	.001712	-.000401	-.000238
12	-.375749	-1.899589	.000024	.000871	-.000432	-.000582
13	-.312650	-2.509372	.000249	-.000024	-.000378	.000012
14	-.232113	-2.518679	.000159	-.000033	.000347	.000173
15	-.189343	-2.721504	.000061	.000027	.000299	-.000623
16	-.330379	-1.604617	-.000016	.001523	.000084	.000815
17	-.428562	-1.827905	-.000019	.001717	-.000081	-.000496
18	-.424804	-3.280035	.000146	-.000095	-.000072	.000109
19	.124183	-.893551	-1.951102	-.000871	-.000889	-.000348
20	.123478	-1.270181	-.755986	.000139	-.001095	-.000315
21	.123231	-1.594741	-.001874	.000462	-.000205	-.000472
22	.123097	-1.863458	.000782	.000561	-.000003	-.000616
23	.078026	-2.455805	.000554	.000934	-.000017	-.000485
24	-.012234	-4.369247	.000255	-.000587	-.000004	.000238
25	-.086989	-2.819010	-.009847	.000890	.000310	.000806
26	-.250589	-1.739250	-2.244315	-.000929	.000522	.000064
27	-.093639	-1.832001	-2.527778	-.000895	-.000327	-.000185
28	.134054	-3.253713	-.325285	.001045	-.000658	-.000340
29	.236182	-3.253880	-.006535	.000612	-.000071	-.000340
30	.124183	-.893551	1.951102	.000871	.000889	-.000348
31	.123478	-1.270181	.755986	-.000139	.001095	-.000315
32	.123231	-1.594741	.001874	-.000462	.000205	-.000472
33	.123097	-1.863458	-.000782	-.000561	.000003	-.000616
34	.078026	-2.455805	-.000554	-.000934	.000017	-.000485
35	-.012234	-4.369247	-.000255	.000587	.000004	.000238
36	-.086989	-2.819010	.009847	-.000890	-.000310	.000806
37	-.250589	-1.739250	2.244315	.000929	-.000522	.000064
38	-.093639	-1.832001	2.527778	.000895	.000327	-.000185
39	.134054	-3.253713	.325285	-.001045	.000658	-.000340
40	.236182	-3.253880	.006535	-.000612	.000071	-.000340
41	.054730	-1.892171	-.000789	.000263	-.000002	-.000690
42	.054741	-2.218989	.000345	.000311	-.000027	-.000684
43	.054568	-3.169634	.000232	.000685	-.000013	-.000679
44	.054307	-3.984305	.000114	-.000337	.000040	-.000016
45	.054283	-3.456881	-.003954	.000594	.000050	.000573
46	.054730	-1.892171	.000789	-.000263	.000002	-.000690
47	.054741	-2.218989	-.000345	-.000311	.000027	-.000684
48	.054568	-3.169634	-.000232	-.000685	.000013	-.000679
49	.054307	-3.984305	-.000114	.000337	-.000040	-.000016
50	.054283	-3.456881	.003954	-.000594	-.000050	.000573
51	-.068212	.033727	.000332	-.000282	.000045	-.000145
52	-.067535	-.215494	-.000093	-.000569	.000122	-.000503
53	-.068679	-1.388424	-.000057	-.000167	.000029	-.000889
54	-.068844	-2.526258	-.000100	.000006	.000056	-.000642
55	-.381887	-2.527066	-.000077	.000000	-.000029	-.000501
56	-.381439	-2.983163	-.000009	.000002	.000012	-.000059
57	-.380991	-2.707516	-.000017	-.000003	-.000039	.000395
58	-.381064	-1.795297	.000022	.000001	.000010	.000710
59	-.381137	-.593523	-.000011	-.000520	-.000014	.000730
60	-.381317	.000000	.000000	.000001	.000000	-.000045
61	-.381497	-.687664	.000007	-.000587	.000010	-.000804
62	-.381539	-1.310593	-.000016	.000001	-.000004	-.000840

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JOINT	U(X)	U(Y)	U(Z)	R(X)	R(Y)	R(Z)
63	-.381671	-3.339716	-.000038	[illegible]	[illegible]	[illegible]
64	[illegible]068	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
65	-.067535	-.215494	.000093	.000282	-.000045	-.000145
66	-.068879	-1.388424	.000057	.000569	.000122	-.000503
67	-.068844	-2.526258	.000100	.000167	-.000029	-.000889
68	-.381887	-2.527066	.000077	-.000006	-.000056	-.000642
69	-.381439	-2.983163	.000009	.000000	.000029	-.000501
70	-.380991	-2.707516	.000017	-.000002	-.000012	-.000059
71	-.381064	-1.795297	-.000022	.000003	.000039	.000395
72	-.381137	-.593523	.000011	-.000001	-.000010	.000710
73	-.381317	.000000	.000000	.000520	.000014	.000730
74	-.381497	-.687664	-.000007	-.000001	.000000	-.000045
75	-.381539	-1.310593	.000016	.000587	-.000010	-.000804
76	-.381671	-3.339716	.000038	-.000001	.000004	-.000840
77	.0000E+00	.0000E+00	.0000E+00	-.000021	-.000014	-.000839
				.0000E+00	.0000E+00	-.5032E-03

R E A C T I O N S A N D A P P L I E D F O R C E S

LOAD CONDITION 1 - FORCES "F" AND MOMENTS "M"

JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
1	.0000E+00	.2387E-11	.0000E+00	-.3586E-09	.3638E-11	-.3297E-11
2	-.4690E-11	-.1000E-10	.0000E+00	.1965E-09	-.2183E-10	-.6560E-10
3	-.2132E-11	.1694E-10	.0000E+00	.2801E-09	.2547E-10	.1447E-09
4	.3425E-11	.4481E-10	.0000E+00	.1145E-08	.5639E-10	.1245E-09
5	.0000E+00	-.2382E-10	.0000E+00	-.4291E-08	-.6548E-10	.7458E-10
6	-.1400E-11	-.8570E-11	.0000E+00	.1637E-09	-.1010E-09	-.6071E-10
7	.2000E-11	.1819E-11	.0000E+00	-.8172E-09	.6412E-10	-.4658E-10
8	.0000E+00	-.7049E-11	.0000E+00	-.6798E-09	-.5161E-10	-.9044E-10
9	.0000E+00	-.1506E-11	.0000E+00	-.5994E-09	.2274E-11	-.2501E-10
10	.0000E+00	.3411E-11	.0000E+00	-.1046E-09	.7276E-11	-.6548E-10
11	-.3482E-11	-.1353E-10	.0000E+00	.5657E-09	-.2910E-10	.1597E-10
12	-.1791E-11	-.5457E-11	.0000E+00	-.5548E-09	.7276E-11	-.1266E-09
13	.0000E+00	.7625E-10	.0000E+00	.2234E-08	.2910E-10	-.1451E-09
14	.1393E-11	-.4849E-10	.0000E+00	.9827E-09	-.2183E-10	-.1127E-09
15	.1734E-11	-.2930E-10	.0000E+00	.7553E-09	-.1000E-10	-.5434E-10
16	.0000E+00	-.3411E-11	.0000E+00	-.2974E-09	.6344E-10	.6469E-10
17	-.1863E-11	-.5912E-11	.0000E+00	.3274E-09	.7890E-10	-.4832E-11
18	.0000E+00	-.1748E-10	.0000E+00	-.9459E-09	-.1489E-10	-.3411E-11
19	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.0000E+00	.2274E-10
20	.1574E-11	-.1007E-11	.0000E+00	.2416E-11	-.5642E-11	.3092E-10
21	.0000E+00	.0000E+00	.0000E+00	.1607E-10	.0000E+00	-.3419E-09
22	-.6540E-11	.6292E-11	.0000E+00	.2399E-10	-.6139E-11	.8146E-10
23	.1741E-11	-.1453E-10	.0000E+00	.2383E-09	.2331E-11	.1884E-09
24	.0000E+00	.0000E+00	.0000E+00	-.1535E-11	.0000E+00	-.2933E-10
25	.0000E+00	.2505E-11	.0000E+00	-.7276E-10	.1194E-11	.6273E-10
26	.1080E-11	-.3922E-11	.0000E+00	.0000E+00	-.4093E-11	-.7162E-10
27	.1702E-11	.0000E+00	.0000E+00	.0000E+00	.1126E-11	-.7276E-11
28	.0000E+00	-.7378E-10	.0000E+00	-.5230E-11	.2046E-11	.1728E-10
29	.0000E+00	.6612E-10	.0000E+00	-.3638E-11	.0000E+00	.8861E-10
30	.0000E+00	-.3752E-11	.0000E+00	.0000E+00	-.9422E-11	-.6912E-10
31	.0000E+00	.1165E-11	.0000E+00	.2039E-11	-.3297E-11	-.7367E-10
32	.0000E+00	.0000E+00	.0000E+00	-.8636E-10	-.1251E-11	-.1454E-09
33	.2931E-11	.7029E-11	.0000E+00	-.1115E-09	.0000E+00	-.1806E-09
34	.0000E+00	.7461E-11	.0000E+00	.2146E-09	.0000E+00	.1918E-10
35	.1612E-11	.0000E+00	.0000E+00	-.1206E-09	.1819E-11	-.4067E-10
36	.0000E+00	.2981E-11	.0000E+00	.3911E-10	.1194E-11	-.1779E-10
37	.2494E-11	.4775E-11	.0000E+00	.3752E-11	.1279E-11	.2183E-10
38	-.1961E-11	-.3762E-11	.0000E+00	-.2871E-11	-.1283E-11	-.7276E-11
39	.2011E-11	-.2274E-10	.0000E+00	-.5093E-10	.1251E-11	-.1128E-09
40	.0000E+00	-.1116E-10	.0000E+00	.3638E-11	.0000E+00	-.4253E-10
41	.1548E-11	-.2441E-11	.0000E+00	.7255E-11	.0000E+00	-.3924E-09
42	.0000E+00	.0000E+00	.0000E+00	.2684E-10	.0000E+00	-.3716E-09
43	.0000E+00	.0000E+00	.0000E+00	.2496E-09	.5329E-11	-.6139E-10
44	.0000E+00	.0000E+00	.0000E+00	-.2805E-10	.0000E+00	.4729E-10
45	.0000E+00	.0000E+00	.0000E+00	-.1492E-09	.0000E+00	.3914E-10
46	.0000E+00	.0000E+00	.0000E+00	-.7053E-10	.0000E+00	-.2918E-09

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JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
47	.0000E+00	.2093E-11	.0000E+00	-.5136E-10	[illegible]	[illegible]
48	.0000E [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
49	.0000E+00	.0000E+00	.0000E+00	-.1636E-09	.0000E+00	.1246E-09
50	.0000E+00	.0000E+00	.0000E+00	.1195E-09	.0000E+00	.4002E-10
51	.0000E+00	.0000E+00	.0000E+00	-.7378E-10	-.2183E-10	.9667E-11
52	.1947E-11	.0000E+00	.0000E+00	.5413E-09	-.5093E-10	-.1671E-10
53	.7219E-11	.0000E+00	.0000E+00	.3072E-09	.3274E-10	.0000E+00
54	-.5606E-11	.1238E-09	.0000E+00	-.7581E-09	.5303E-10	-.2852E-08
55	-.2402E-11	-.3267E-09	.0000E+00	.3080E-08	.4275E-10	-.1455E-08
56	.1084E-10	-.1418E-10	.0000E+00	-.1161E-08	.6980E-10	-.1513E-08
57	.2812E-11	.8868E-11	.0000E+00	.5711E-09	-.5457E-11	.3492E-09
58	-.1974E-11	-.2984E-11	.0000E+00	.1461E-08	-.2933E-10	-.3027E-08
59	-.1166E-10	.0000E+00	.0000E+00	-.9427E-09	.3820E-10	-.1543E-08
60	.0000	4271.5374	-10.9697	.0000	-625.6294	.0000
61	-.4297E-10	-.3610E-11	.0000E+00	.1644E-08	.7958E-10	.0000E+00
62	.1279E-10	.0000E+00	.0000E+00	-.6577E-09	.3291E-10	-.1142E-08
63	.2534E-11	-.5656E-11	.0000E+00	-.1800E-09	.8413E-11	.1271E-08
64	.0000E+00	.0000E+00	.0000E+00	-.2664E-09	-.7276E-11	-.3622E-09
65	.0000E+00	.0000E+00	.0000E+00	.6024E-09	.2910E-10	.9313E-09
66	.0000E+00	-.3240E-11	.0000E+00	-.6305E-09	.1273E-10	.1339E-08
67	.0000E+00	.3606E-09	.0000E+00	-.1960E-09	.1870E-10	-.1979E-08
68	-.8633E-11	-.2376E-10	.1965E-11	.5629E-08	-.4547E-10	.2736E-08
69	.7056E-11	.7365E-11	.0000E+00	.1297E-09	.2728E-11	-.2445E-08
70	-.1323E-10	.1160E-10	.0000E+00	.7607E-09	.2092E-10	.1921E-08
71	-.7315E-11	-.2274E-11	.0000E+00	.5917E-09	-.6366E-10	.2037E-09
72	-.5496E-11	.2956E-11	.0000E+00	-.8090E-09	.8367E-10	-.5530E-09
73	.0000	4271.5374	10.9697	.0000	625.6294	.0000
74	.8809E-11	.2842E-11	.0000E+00	-.1039E-08	.1182E-10	-.1601E-08
75	-.5969E-11	-.5983E-11	.0000E+00	.6225E-10	-.1290E-10	-.2714E-08
76	.1825E-11	.1082E-10	.0000E+00	.2626E-08	.1319E-10	-.2125E-08
77	500.0000	5784.9774	.0000	.0000	.0000	.0000
TOTAL	.5000E+03	.1433E+05	-.1155E-13	.9507E-08	-.6799E-06	-.1616E-07

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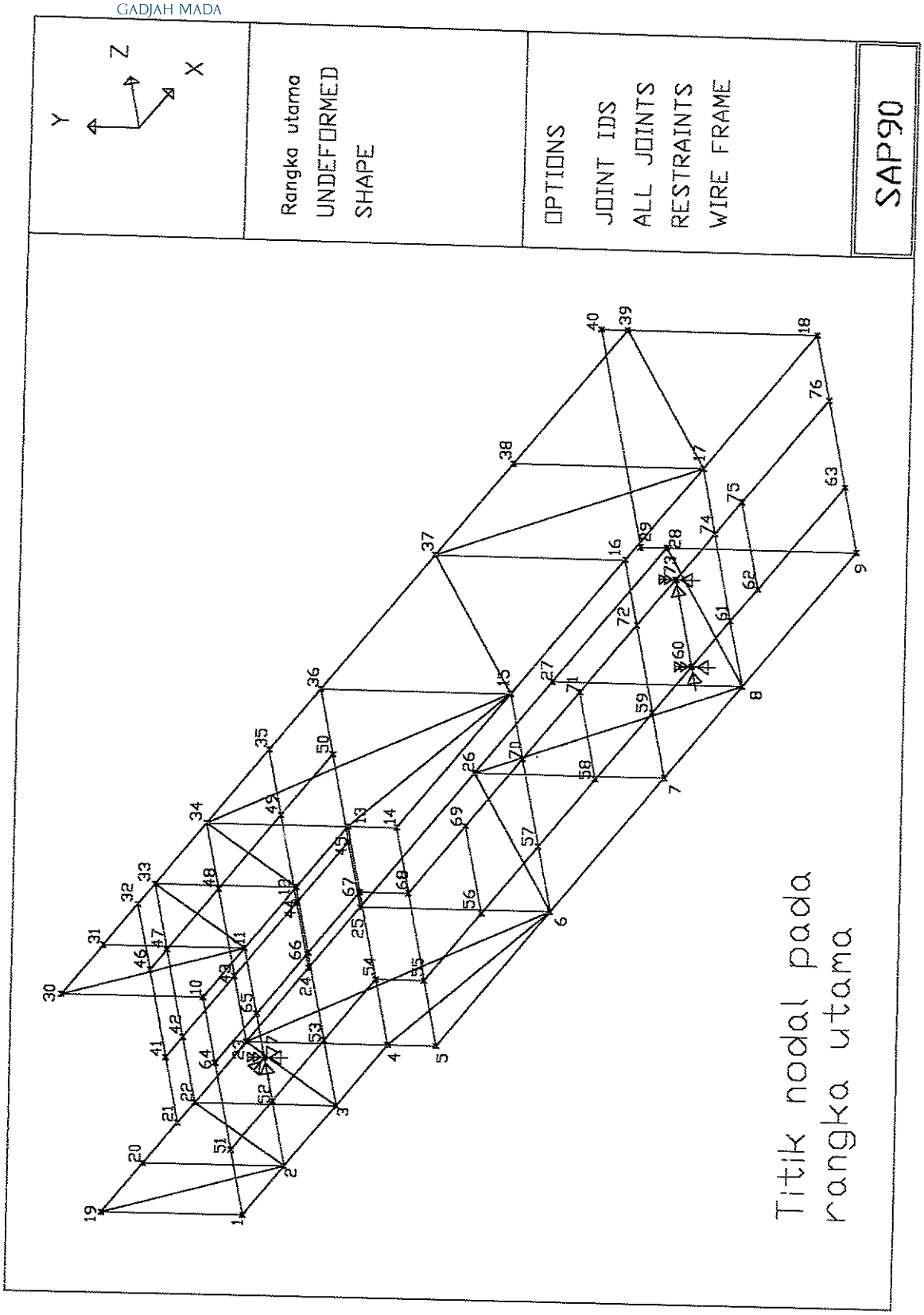

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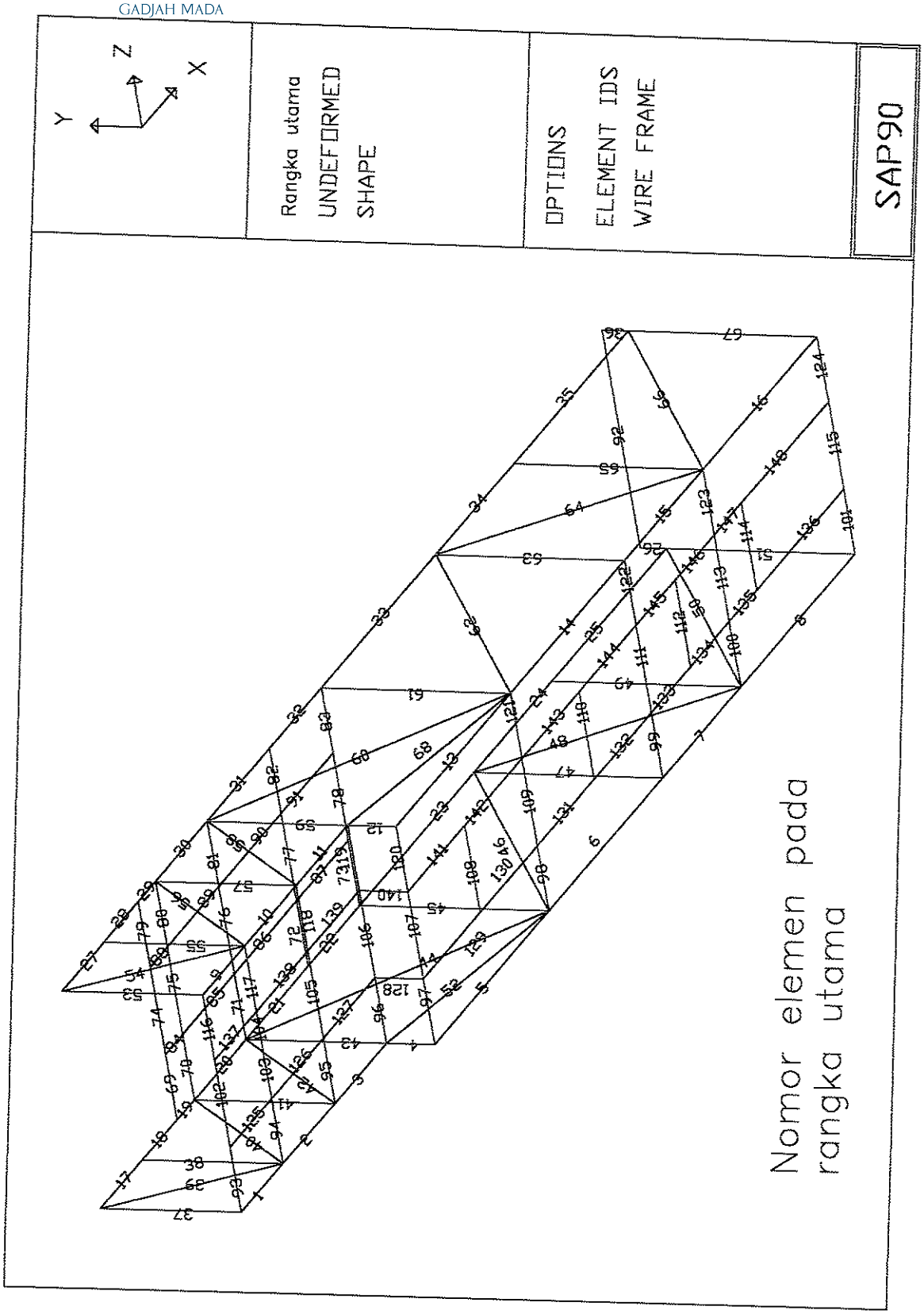

Nomor elemen pada rangka utama

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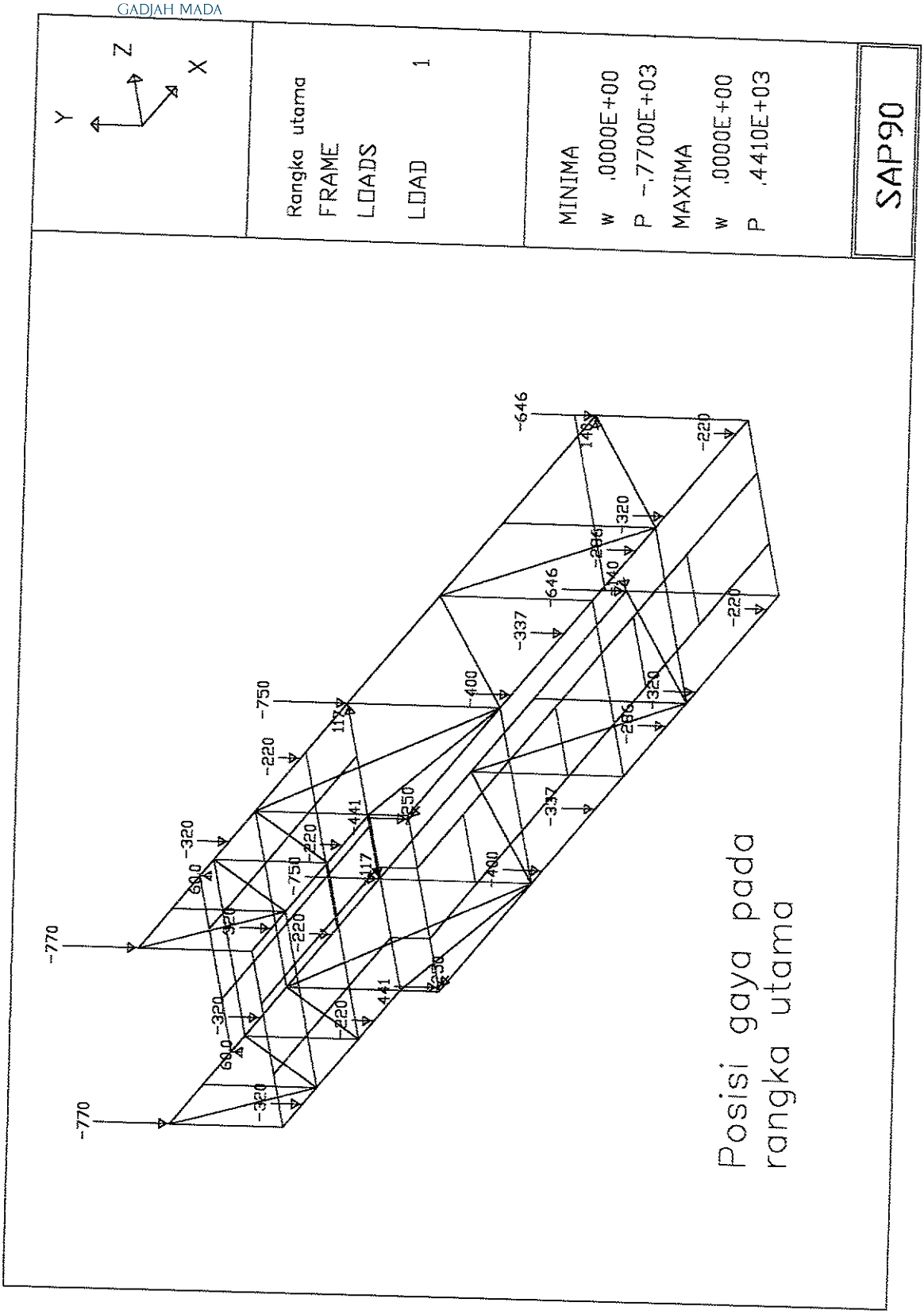

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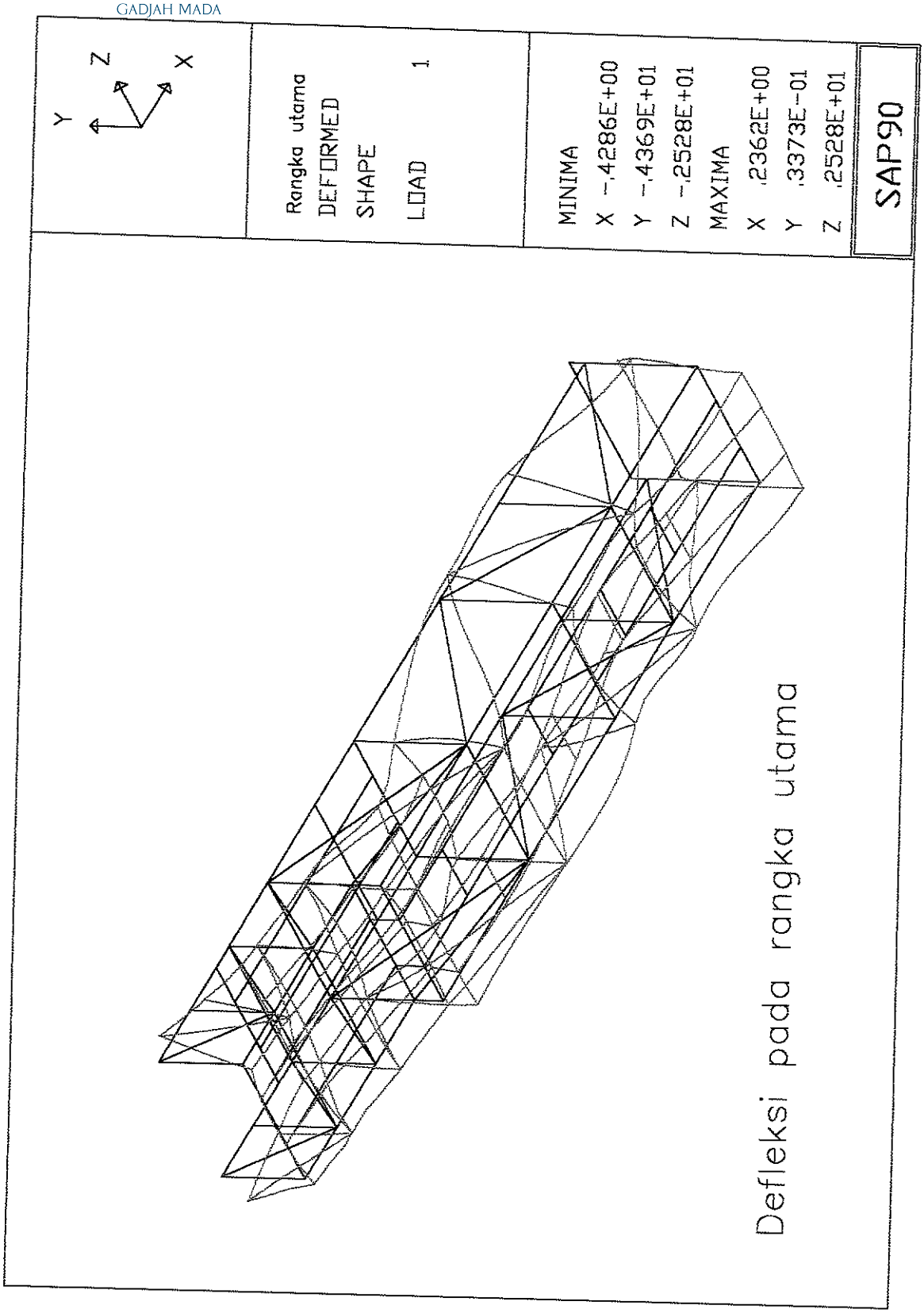

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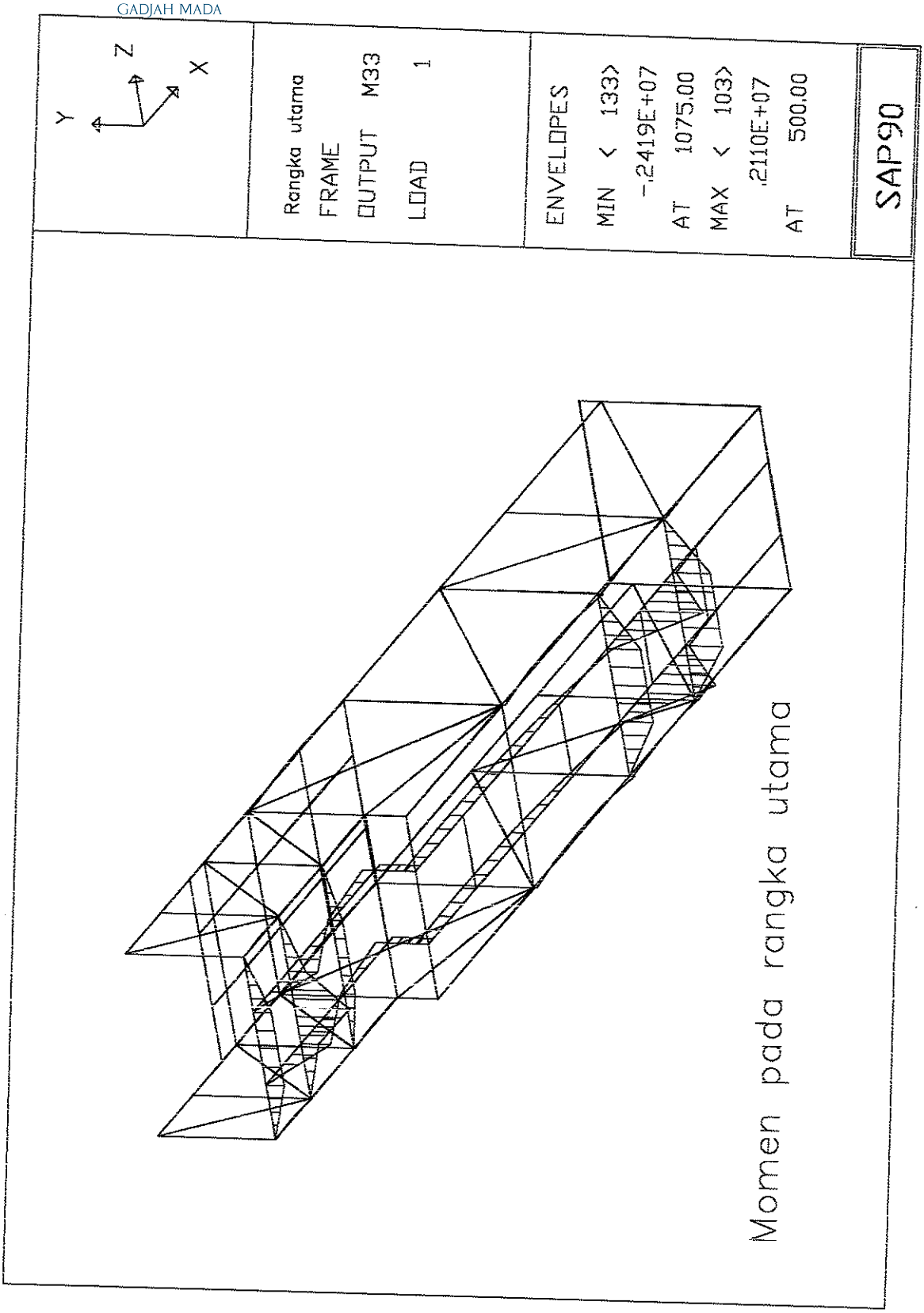

Momen pada rangka utama

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Penandaan*	Luas	Kedalaman	Flens		Tebal Web	Sumbu X-X			Sumbu Y-Y		
			Lebar	Tebal		I	$\frac{I}{c}$	r	I	$\frac{I}{c}$	r
	mm²	d, mm	mm	mm		× 10⁶ mm⁴	× 10³ mm³	mm	× 10⁶ mm⁴	× 10³ mm³	mm
S 610 × 179	22 770	610	204	28,0	20,3	1260	4140	235	35,0	343	39,2
× 157,6	20 060	610	200	28,0	15,9	1180	3860	242	32,5	325	40,3
× 149	18 970	610	184	22,1	19,0	995	3260	229	19,9	216	32,4
× 134	17 100	610	181	22,1	15,8	937	3070	234	18,7	207	33,1
× 118,9	15 160	610	178	22,1	12,7	878	2880	241	17,6	198	34,1
S 510 × 141	18 000	508	183	23,3	20,3	670	2640	193	20,7	226	33,9
× 127	16 130	508	179	23,3	16,6	633	2490	198	19,2	215	34,5
× 112	14 260	508	162	20,1	16,3	533	2100	193	12,3	152	29,4
× 97,3	12 390	508	159	20,1	12,7	491	1930	199	11,4	144	30,3
S 460 × 104	13 290	457	159	17,6	18,1	385	1690	170	10,0	126	27,5
× 81,4	10 390	457	152	17,6	11,7	335	1460	179	8,66	114	28,9
S 380 × 74	9 480	381	143	15,8	14,0	202	1060	146	6,53	91,2	26,3
× 64	8 130	381	140	15,8	10,4	186	977	151	5,99	85,8	27,2
S 310 × 74	9 480	305	139	16,8	17,4	127	833	116	6,53	94,0	26,3
× 60,7	7 740	305	133	16,8	11,7	113	743	121	5,66	84,9	27,0
× 52	6 640	305	129	13,8	10,9	95,3	625	120	4,11	63,7	24,9
× 47,3	6 032	305	127	13,8	8,9	90,7	595	123	3,90	61,4	25,4
S 250 × 52	6 640	254	126	12,5	15,1	61,2	482	96,0	3,48	55,4	22,9
× 37,8	4 806	254	118	12,5	7,9	51,6	406	104	2,83	47,7	24,2
S 200 × 34	4 368	203	106	10,8	11,2	27,0	266	78,6	1,79	33,9	20,3
× 27,4	3 484	203	102	10,8	6,9	24,0	236	82,9	1,55	30,6	21,1
S 180 × 30	3 794	178	97	10,0	11,4	17,7	199	68,2	1,32	26,9	18,7
× 22,8	2 890	178	92	10,0	6,4	15,3	172	72,5	1,10	23,6	19,5
S 150 × 25,7	3 271	152	90	9,1	11,8	11,0	144	57,9	0,961	21,2	17,1
× 18,6	2 362	152	84	9,1	5,8	9,20	121	62,3	0,758	17,9	17,9
S 130 × 22,0	2 800	127	83	8,3	12,5	6,33	99,6	47,5	0,695	16,7	15,8
× 15	1 884	127	76	8,3	5,3	5,12	80,6	52,0	0,508	13,3	16,4
S 100 × 14,1	1 800	102	70	7,4	8,3	2,83	55,6	39,6	0,376	10,6	14,5
× 11,5	1 452	102	67	7,4	4,8	2,53	49,8	41,7	0,318	9,40	14,8
S 75 × 11,2	1 426	76	63	6,6	8,9	1,22	32,0	29,2	0,244	7,66	13,1
× 8,5	1 077	76	59	6,6	4,3	1,05	27,5	31,2	0,189	6,40	13,3

*** Balok Bentuk-I Standar Amerika dipandang sebagai bentuk-S dan ditulis dengan huruf S yang disusul dengan kedalaman dalam milimeter dan massa adalah kilogram per meter linier. Umpamanya, S 610 × 179 berarti ini adalah bentuk S dengan kedalaman 610 mm dan massa 179 kg/m. Harga-harga ini merupakan konversi kira-kira dari yang terdapat dalam tabel-tabel AISC ke dalam satuan SI.**

Lampiran B-1, Tabel balok standar Amerika, bentuk S, sifat untuk disain, disadur dari Mechanics of Material, Popov, E.P, Edisi kedua, Penerbit Erlangga, 1991, Hal 623.

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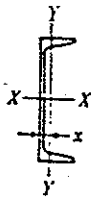

Penandaan*	Luas	Kedalaman	Flens Lebar	Flens Tebal	Tebal Web	Sumbu X-X I	Sumbu X-X $\frac{I}{c}$	Sumbu X-X r	Sumbu Y-Y I	Sumbu Y-Y $\frac{I}{c}$	Sumbu Y-Y r	Sumbu Y-Y x
	mm²	d, mm²	mm	mm	mm	× 10⁶ mm⁴	× 10³ mm³	mm	× 10⁶ mm⁴	× 10³ mm³	mm	mm
C 380 × 74	9480	381	94	16,5	18,2	168	883	133	4,58	97,0	22,0	20,3
× 60	7610	381	89	16,5	13,2	145	763	138	3,84	85,9	22,5	19,8
× 50,4	6426	381	86	16,5	10,2	131	688	143	3,38	78,4	23,0	20,0
C 310 × 45	5690	305	80	12,7	13,0	67,4	442	109	2,14	53,1	19,4	17,1
× 37	4742	305	77	12,7	9,8	59,9	393	112	1,86	48,1	19,8	17,1
× 30,8	3929	305	74	12,7	7,2	53,7	352	117	1,61	43,2	20,3	17,7
C 250 × 45	5690	254	76	11,1	17,1	42,9	338	86,8	1,64	42,6	17,0	16,5
× 37	4742	254	73	11,1	13,4	38,0	299	89,5	1,40	38,2	17,2	15,7
× 30	3794	254	69	11,1	9,6	32,8	259	93,0	1,17	33,6	17,6	15,4
× 22,8	2897	254	65	11,1	6,1	28,1	221	98,4	0,949	28,7	18,1	16,1
C 230 × 30	3794	229	67	10,5	11,4	25,3	222	81,7	1,01	30,0	16,3	14,8
× 22	2845	229	63	10,5	7,2	21,2	186	86,4	0,803	25,5	16,8	14,9
× 19,9	2542	229	61	10,5	5,9	19,9	174	88,6	0,733	23,7	17,0	15,3
C 200 × 27,9	3555	203	64	9,9	12,4	18,3	180	71,8	0,824	25,7	15,2	14,4
× 20,5	2606	203	59	9,9	7,7	15,0	148	75,9	0,637	21,4	15,6	14,0
× 17,1	2181	203	57	9,9	5,6	13,6	134	78,9	0,549	19,1	15,9	14,5
C 180 × 22,0	2794	178	58	9,3	10,6	11,3	127	63,7	0,574	19,7	14,3	13,5
× 18,2	2323	178	55	9,3	8,0	10,1	113	65,9	0,487	17,5	14,5	13,3
× 14,6	1852	178	53	9,3	5,3	8,87	99,7	69,2	0,403	15,2	14,8	13,7
C 150 × 19,3	2471	152	54	8,7	11,1	7,24	95,0	54,1	0,437	16,0	13,3	13,1
× 15,6	1994	152	51	8,7	8,0	6,33	83,0	56,3	0,360	13,9	13,4	12,7
× 12,2	1548	152	48	8,7	5,1	5,45	71,6	59,3	0,288	11,8	13,6	13,0
C 130 × 13,4	1703	127	47	8,1	8,3	3,70	58,3	46,6	0,263	11,0	12,4	12,1
× 10,0	1271	127	44	8,1	4,8	3,12	49,1	49,5	0,199	8,95	12,5	12,3
C 100 × 10,8	1374	102	43	7,5	8,2	1,91	37,6	37,3	0,180	8,23	11,4	11,7
× 8,0	1026	102	40	7,5	4,7	1,60	31,5	39,5	0,133	6,60	11,4	11,6
C 75 × 8,9	1135	76	40	6,9	9,0	0,862	22,6	27,5	0,127	6,26	10,6	11,6
× 7,4	948	76	37	6,9	6,6	0,770	20,2	28,5	0,103	5,40	10,4	11,1
× 6,1	781	76	35	6,9	4,3	0,691	18,1	29,8	0,082	4,58	10,2	11,1

*** Kanal Baja Standar Amerika ditulis dengan huruf C disusul oleh kedalamannya dalam milimeter, dengan massa dalam kilogram per meter linier dibelakangnya. Umpamanya C 380 × 74 berarti bahwa kanal ini kedalamannya 380 mm dan massanya 74 kg/m. Harga-harga ini merupakan konversi rata-rata dari yang terdapat dalam Tabel AISC ke dalam satuan SI.**

Lampiran B-2, Tabel kanal baja standar Amerika, sifat untuk disain, disadur dari Mechanics of Material, Popov, E.P, Edisi kedua, Penerbit Erlangga, 1991, Hal 623.

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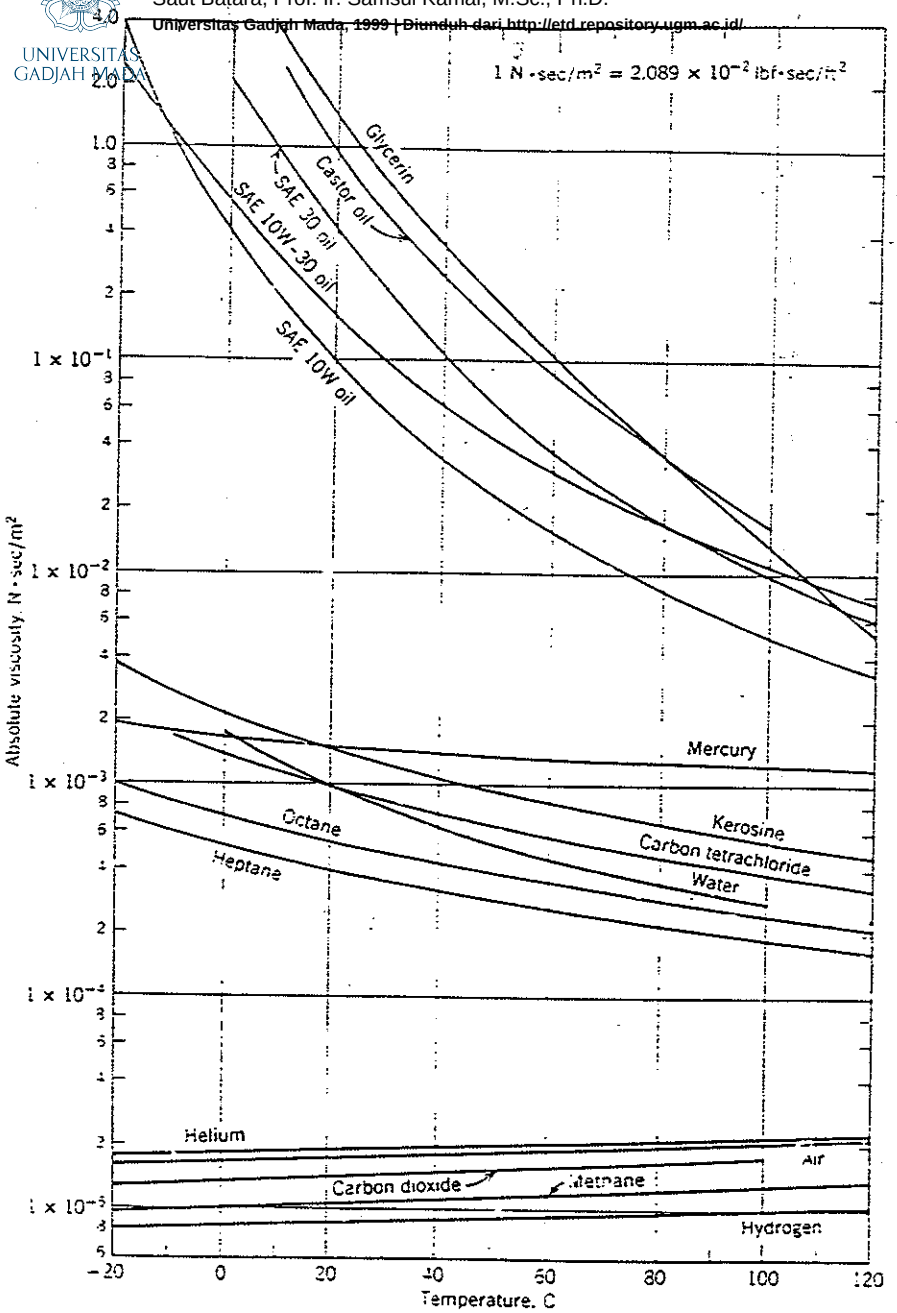

Lampiran C-1, Grafik viskositas absolut dari jenis fluida fungsi temperatur, disadur dari Introduction To Fluid Mechanics, Rober W.Fox, Alan T.McDonald, edisi ke-2, Hal 614.

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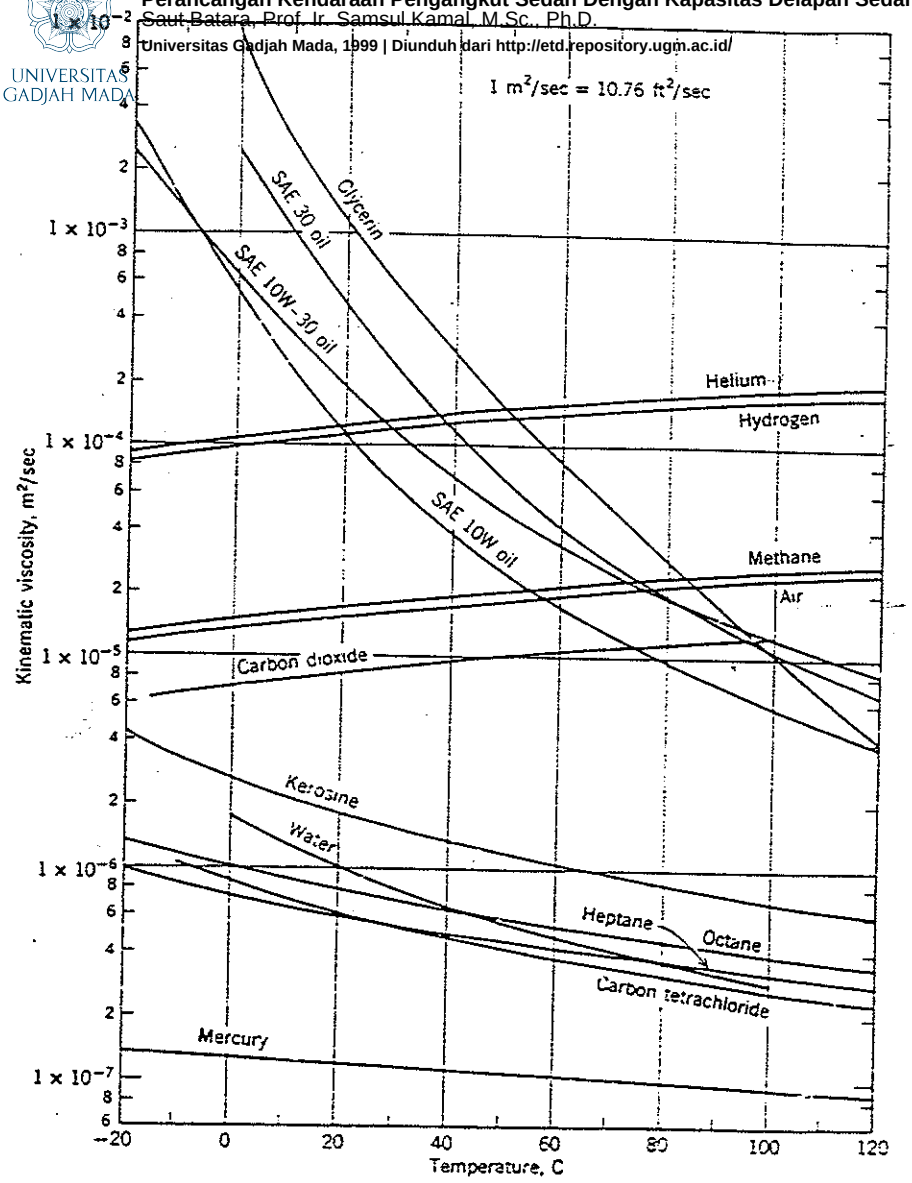

Lampiran C-2, Grafik viskositas kinematik dari jenis fluida fungsi temperatur, disadur dari Introduction To Fluid Mechanics, Robert W.Fox, Alan T.McDonald, edisi ke-2, Hal 615.

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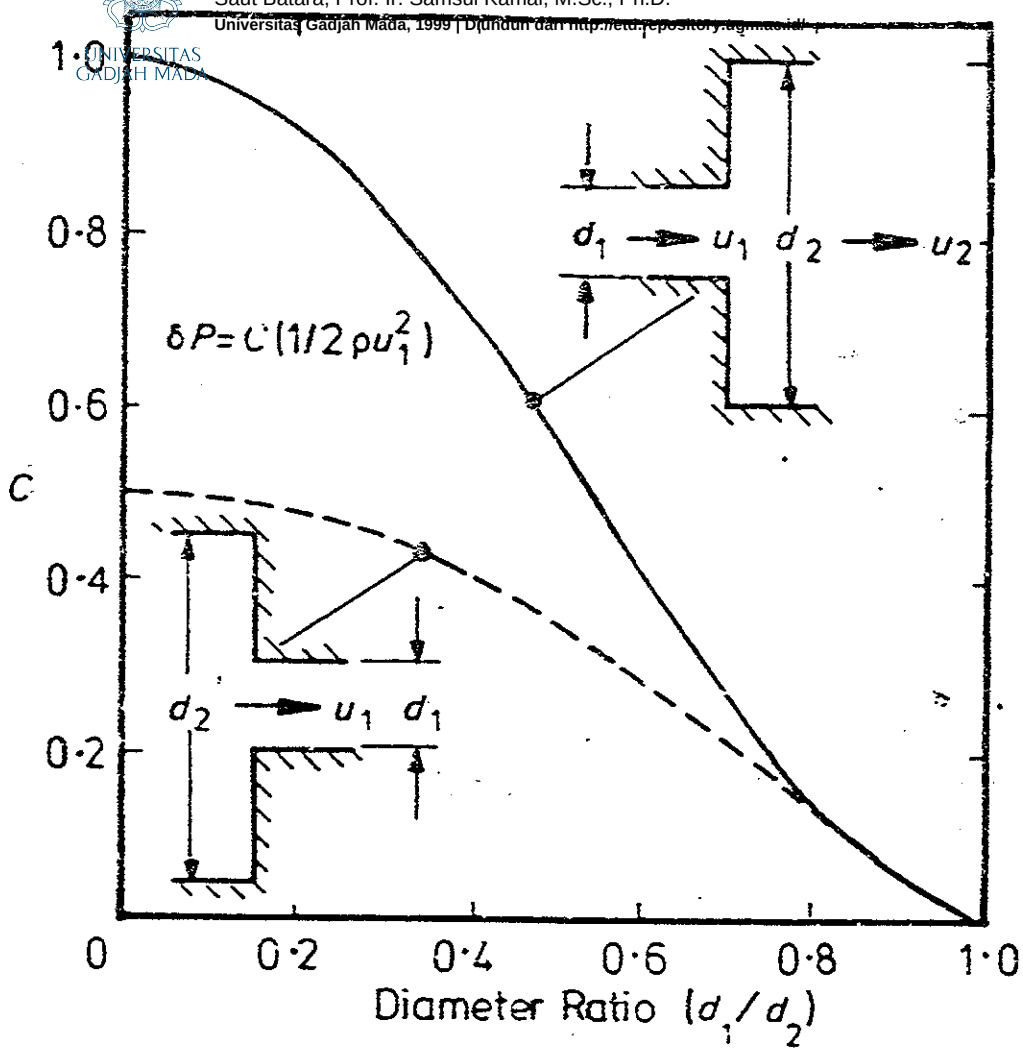

Lampiran C-3, Grafik koefisien pipa masukan dan keluaran, disadur dari Control of Fluid Power Analysis and Design, edisi ke-2, Mc Cloy D,hal 209

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Representative Dimensionless Equivalent Lengths (L_e/D) for Valves and Fittings (data from Ref. 2)

Fitting Type	Description	Equivalent Length, L_e/D*
Globe valve	Fully open	350
Gate valve	Fully open	13
	$\frac{3}{4}$ open	35
	$\frac{1}{2}$ open	160
	$\frac{1}{4}$ open	900
Check valve		50–100
90° std. elbow		30
45° std. elbow		16
90° elbow	Long radius	20
90° street elbow		50
45° street elbow		26
Tee	Flow through run	20
	Flow through branch	60
Return bend	Close pattern	50

* Based on $h_{L_m} = f\frac{L_e}{D}\frac{V^2}{2}$

Lampiran C-4, Tabel panjang equivalen untuk sambungan dan katup, disadur dari Introduction To Fluid Mechanics, Robert W.Fox, Alan T.McDonald, edisi ke-2, Hal 376.

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HOSE SIZE	HOSE SAE	INSIDE DIAM INCHES	OUTSIDE DIAM INCHES	AREA SQ. IN.	FLOW RATE GPM @ 10 FPS	MINIMUM BEND RADIUS – INCHES	PRESSURE – PSI WORKING	PRESSURE – PSI BURST
3/16	100–R1	3/16	1/2	.0276	.866	4	3000	12000
3/16	100–R2A	3/16	5/8	.0276	.866	4	5000	20000
–4	100–R5	3/16	33/64	.0276	.866	3	3000	12000
1/4	100–R1	1/4	5/8	.0491	1.54	4	2750	11000
1/4	100–R2A	1/4	11/16	.0491	1.54	4	5000	20000
1/4	100–R3	1/4	9/16	.0491	1.54	3	1250	5000
–5	100–R5	1/4	37/64	.0491	1.54	3¾	2500	10000
5/16	100–R1	5/16	11/16	.0767	2.40	5	2500	10000
5/16	100–R2A	5/16	3/4	.0767	2.40	4½	4250	17000
–6	100–R5	5/16	43/64	.0767	2.40	4	2250	9000
3/8	100–R1	3/8	25/32	.1104	3.46	5	2250	9000
3/8	100–R2A	3/8	27/32	.1104	3.46	5	4000	16000
3/8	100–R3	3/8	3/4	.1104	3.46	4	1125	4500
13/32	100–R1	13/32	13/16	.1296	4.06	5½	2250	9000
–8	100–R5	13/32	49/64	.1296	4.06	4½	2000	8000
1/2	100–R1	1/2	29/32	.1963	6.15	7	2000	8000
1/2	100–R2A	1/2	31/32	.1963	6.15	7	3500	14000
1/2	100–R3	1/2	15/16	.1963	6.15	5	1000	4000
–10	100–R5	1/2	59/64	.1963	6.15	5	1750	7000
5/8	100–R1	5/8	1 3/32	.3068	9.61	8	1500	6000
5/8	100–R2A	5/8	1 3/32	.3068	9.61	8	2750	11000
–12	100–R5	5/8	1 5/64	.3068	9.61	6½	1500	6000
3/4	100–R1	3/4	1 3/16	.4418	13.8	9½	1250	5000
3/4	100–R2A	3/4	1 ¼	.4418	13.8	9½	2250	9000
3/4	100–R3	3/4	1 ¼	.4418	13.8	6	750	3000
3/4	100–R4	3/4	1 ¼	.4418	13.8	5	300	1200
7/8	100–R1	7/8	1 5/16	.6013	18.8	11	1125	4500
7/8	100–R2A	7/8	1 ⅜	.6013	18.8	11	2000	8000
–16	100–R5	7/8	1 25/64	.6013	18.8	7½	800	3200
1	100–R1	1	1 ½	.7854	24.6	11	1000	4000
1	100–R2A	1	1 9/16	.7854	24.6	11	2000	8000
1	100–R3	1	1 ½	.7854	24.6	8	550	2250
1	100–R4	1	1 ½	.7854	24.6	6	250	1000
–20	100–R5	1¼	1 ½	.9940	31.1	9	625	2500
1¼	100–R1	1¼	1 13/16	1.227	38.4	16	625	2500
1¼	100–R2A	1¼	2	1.227	38.4	16½	1625	6500
1¼	100–R3	1¼	1 ¾	1.227	38.4	10	375	1500
1¼	100–R4	1¼	1 51/64	1.227	38.4	8	200	800
–24	100–R5	1⅜	1 ¾	1.485	46.5	10½	500	2000
1½	100–R1	1½	2 1/16	1.767	55.4	20	500	2000
1½	100–R2A	1½	2 ¼	1.767	55.4	20	1250	5000
1½	100–R4	1½	2 5/64	1.767	55.4	10	150	600
–32	100–R5	1 13/16	2 7/32	2.580	80.8	13¼	350	1400
2	100–R1	2	2 ¾	3.142	98.4	25	375	1500
2	100–R2A	2	2 ¾	3.142	98.4	22	1125	4500
2	100–R4	2	2 ½	3.142	98.4	12	100	400
2½	100–R4	2½	3 ⅛	4.909	154.	14	65	250
3	100–R4	3	3 ⅝	7.069	221.	18	55	225
3½	100–R4	3½	4 ⅛	9.621	301.	22	50	200
4	100–R4	4	4 ¾	12.566	394.	26	50	200

Lampiran C-5, Tabel diameter hose, disadur dari Plant Engineering magazines Fluid Power Handbook volume 2, Anton H.Hehn, 1993, Hal 272-273.

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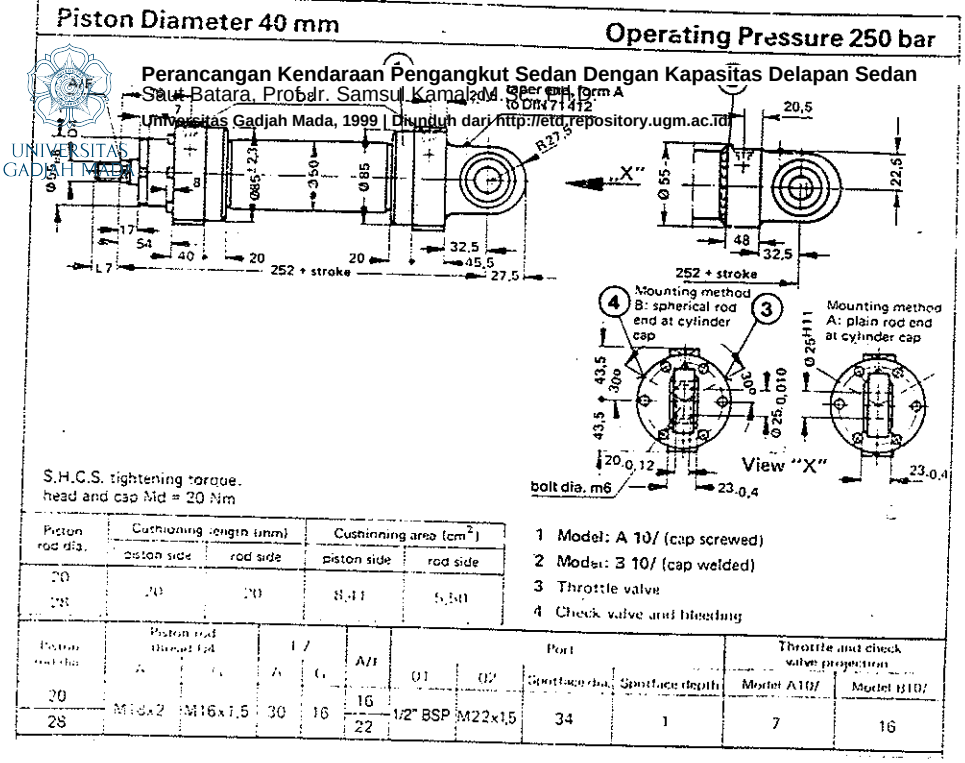
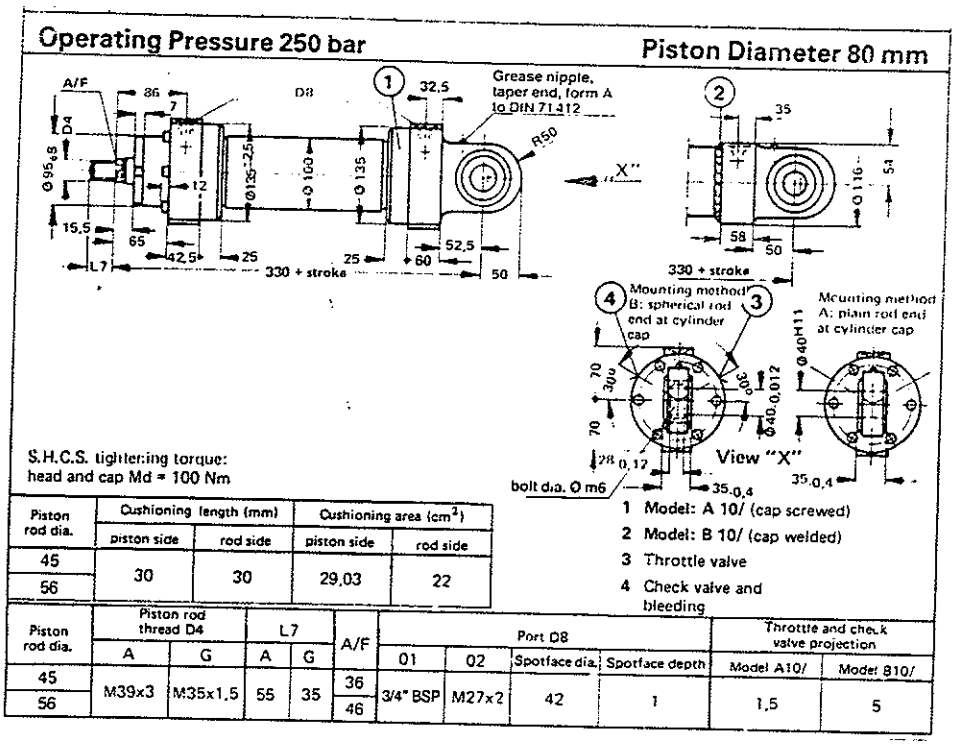


Piston rod dia.	Cushioning length (mm)		Cushioning area (cm²)	
	piston side	rod side	piston side	rod side
20	20	20	8,41	5,30
28				

Piston rod dia.	Piston rod thread D4		L7		A/F	Port				Throttle and check valve projection	
	A	G	A	G		01	02	Spotface dia.	Spotface depth	Model A10/	Model B10/
20	M16x2	M16x1,5	30	16	16	1/2" BSP	M22x1,5	34	1	7	16
28					22						

Lampiran D-1, Data silinder hidrolik dengan diameter piston 40 mm, dan diameter piston rod 28 mm, disadur dari kataloq Hidraulic cylinders, Mannesmann Rexroth, hal 238.



Piston rod dia.	Cushioning length (mm)		Cushioning area (cm²)	
	piston side	rod side	piston side	rod side
45	30	30	29,03	22
56				

Piston rod dia.	Piston rod thread D4		L7		A/F	Port D8				Throttle and check valve projection	
	A	G	A	G		01	02	Spotface dia.	Spotface depth	Model A10/	Model B10/
45	M39x3	M35x1,5	55	35	36	3/4" BSP	M27x2	42	1	1,5	5
56					46						

Lampiran D-2, Data silinder hidrolik dengan diameter piston 80mm, dan diameter piston rod 56 mm, disadur dari. kataloq Hidraulic cylinders, Mannesmann Rexroth, hal 239.

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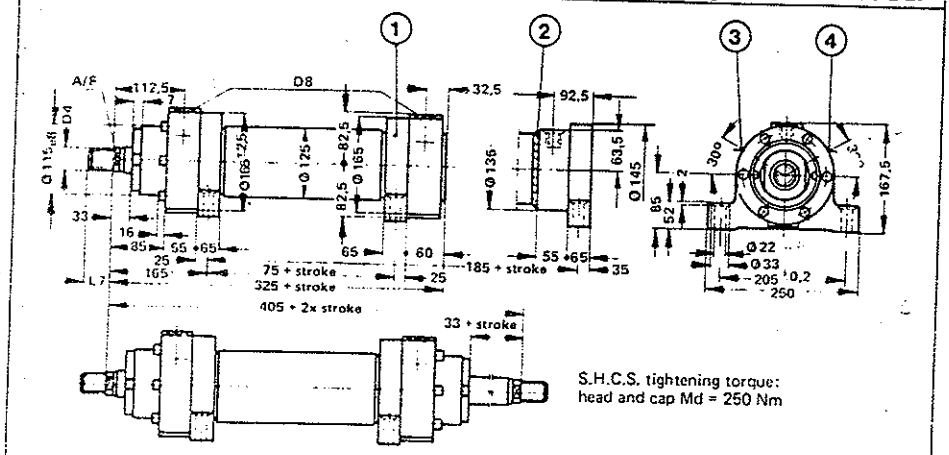
Piston Diameter 100 mm — **Operating Pressure 250 bar**



S.H.C.S. tightening torque:
head and cap Md = 250 Nm

1 Model: A 10/ (cap screwed)
2 Model: B 10/ (cap welded)
3 Throttle valve
4 Check valve and bleeding

Piston rod dia	Cushioning length (mm)		Cushioning area (cm²)	
	piston side	rod side	piston side	rod side
56 / 70	35	35	42,22	35,53

Piston rod dia	Piston rod thread (in)		L7		A/F	Port				Throttle and check valve projection	
	A	G	A	G		01	02	Spotface dia.	Spotface depth	Model A10/	Model B10/
56 / 70	M50x3	M45x1,5	75	45	46 / 60	1" BSP	M33x2	47	1		11,5

Lampiran D-3, Data silinder hidrolik dengan diameter piston 100 mm, dan diameter piston rod 70 mm, disadur dari kataloq Hidraulic cylinders, Mannesmann Rexroth, hal 288.

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MANNESMANN REXROTH

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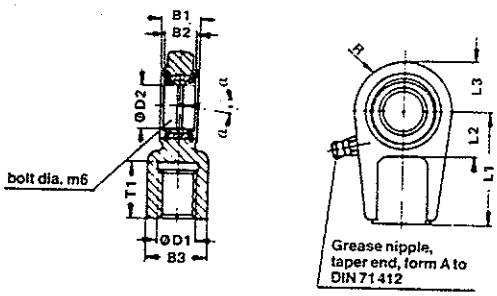
for

Hydraulic Cylinders Type CD 250/CG 250

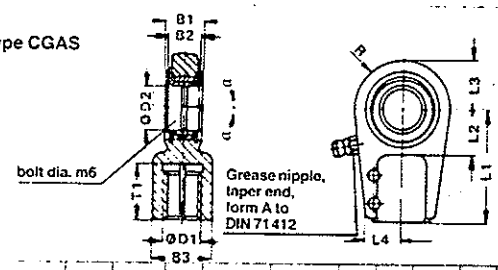
Spherical Rod End Type CGA



Piston dia.	Type	min kg	Part no.	$B1_{-0.4}$	B2	B3	D1	ØD2	L1	L2	L3	R	T1	α
40	CGA 16	0,43	303125	23	$20_{-0.12}$	28	M 16x1,5	$25_{-0.010}$	50	25	30	28	17	8°
50	CGA 22	0,7	303126	28	$22_{-0.12}$	34	M 22x1,5	$30_{-0.010}$	60	30	34	32	23	7°
63	CGA 28	1,1	303127	30	$25_{-0.12}$	44	M 28x1,5	$35_{-0.012}$	70	40	42	39	29	7°
80	CGA 35	2,0	303128	35	$28_{-0.12}$	55	M 35x1,5	$40_{-0.012}$	85	45	50	47	36	7°
100	CGA 45	3,3	303129	40	$35_{-0.12}$	70	M 45x1,5	$50_{-0.012}$	105	55	63	58	46	7°
125	CGA 58	5,5	303130	50	$44_{-0.15}$	87	M 58x1,5	$60_{-0.015}$	130	65	70	65	59	7°
140	CGA 65	8,6	303131	55	$49_{-0.15}$	93	M 65x1,5	$70_{-0.015}$	150	75	82	77	66	6°
160	CGA 80	12,2	303132	60	$55_{-0.15}$	125	M 80x2	$80_{-0.015}$	170	80	95	88	81	5°
180	CGA 100	21,5	303133	65	$60_{-0.20}$	143	M100x2	$90_{-0.020}$	210	90	113	103	101	6°
200	CGA 110	27,5	303134	70	$70_{-0.20}$	153	M110x2	$100_{-0.020}$	235	105	125	115	111	7°
220	CGA 120	40,7	303135	80	$70_{-0.20}$	176	M120x3	$110_{-0.020}$	265	115	142,5	132,5	125	7°
250	CGA 120	40,7	303135	80	$70_{-0.20}$	176	M120x3	$110_{-0.020}$	265	115	142,5	132,5	125	7°
280	CGA 130	76,4	303136	90	$85_{-0.20}$	198	M130x3	$120_{-0.020}$	310	140	160	170	135	6°
320	-	-	-	-	-	-	-	-						

Lampiran D-4, Data clevis silinder hidrolik , disadur dari kataloq Hidraulic cylinders, Mannesmann Rexroth, hal 247.

Spherical Rod End Type CGAS
(with locking serews)



Piston dia	Type	m min kg	Part no.	$B1_{-0.4}$	B2	B3	D1	OD2	L1	L2	L3	L4	R	T1	S.H.C.S. DIN912	S.H.C.S. Md Nm	α
40	CGAS 25	0,65	303137	23	$20_{-0.12}$	28	M 18x2	$25_{-0.010}$	65	25	30	24	28	30	M 8x..	20	8°
50	CGAS 30	1,0	303138	28	$22_{-0.12}$	34	M 24x2	$30_{-0.010}$	75	30	34	27	32	35	M 8x20	20	7°
63	CGAS 35	2,4	303139	30	$25_{-0.12}$	44	M 30x2	$35_{-0.012}$	90	40	42	33	39	45	M10x25	40	7°
80	CGAS 40	2,4	303140	35	$28_{-0.12}$	55	M 39x3	$40_{-0.012}$	105	45	50	39	47	55	M12x30	80	7°
100	CGAS 50	4,1	303141	40	$35_{-0.12}$	70	M 50x3	$50_{-0.012}$	135	55	63	45	58	75	M12x30	80	7°
125	CGAS 60	6,5	303142	50	$44_{-0.15}$	87	M 64x3	$60_{-0.015}$	170	65	70	59	65	95	M16x40	160	7°
140	CGAS 70	9,5	303143	55	$49_{-0.15}$	105	M 80x3	$70_{-0.015}$	195	75	83	65	77	110	M16x40	160	6°
160	CGAS 80	16	303144	60	$55_{-0.15}$	125	M 90x3	$80_{-0.015}$	210	80	95	76	88	120	M20x50	300	6°
180	CGAS 90	28	303145	65	$60_{-0.20}$	150	M100x3	$90_{-0.020}$	250	90	113	81	103	140	M20x50	300	5°
200	CGAS 100	34	303146	70	$70_{-0.20}$	170	M110x4	$100_{-0.020}$	275	105	125	86	115	150	M20x50	300	7°
220	CGAS 110	44	303147	80	$70_{-0.20}$	180	M120x4	$110_{-0.020}$	300	115	142,5	97	132,5	160	M24x60	500	5°
250	CGAS 110	44	303147	80	$70_{-0.20}$	180	M120x4	$110_{-0.020}$	300	115	142,5	97	132,5	160	M24x60	500	6°
280	CGAS 120	75	303148	90	$85_{-0.20}$	210	M150x4	$120_{-0.020}$	360	140	180	112	170	190	M24x60	500	6°
320	CGAS 140	160	317314	110	$90_{-0.25}$	230	M160x4	$140_{-0.025}$	420	185	200	123	190	200	M30x80	1000	7°

Lampiran D-5, Data clevis silinder hidrolik , disadur dari kataloq Hidraulic cylinders, Mannesmann Rexroth, hal 296.

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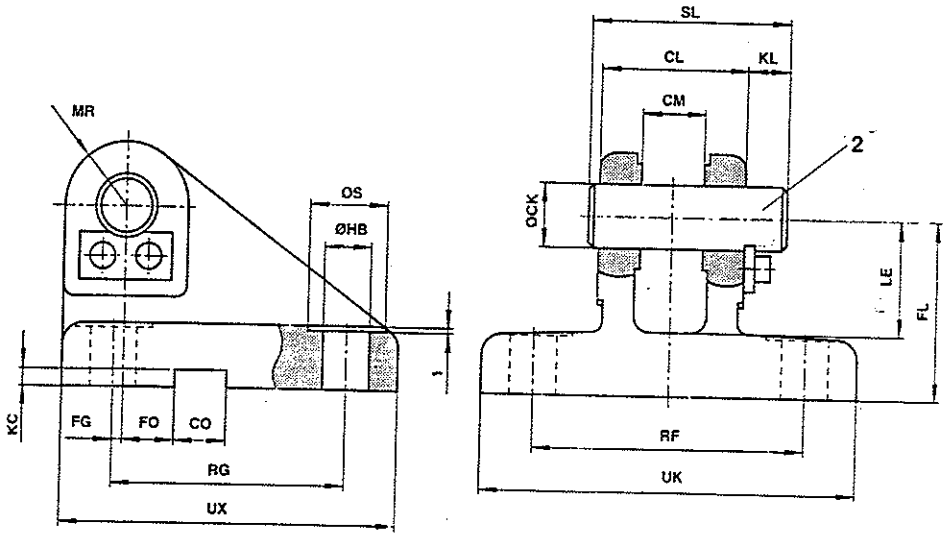
ISO 8132
Form B



2 associated pin diameter tolerance r6
(Pins and pin securing rings are included in supply)

compatible with swivel clevis head CGKD...page10

Series CD 161 Piston dia	Series CD 251 Piston dia	Type	Order number	m in kg	Dimensions in mm Ø CK H9	CL h16	SL	CM A12	FL js 12	Ø HB H13	ØS	KL	LE min.	MR max.	RG js 14	RF js 14	UX max.	UK max.	FG js 14	KC -0,3	FO js 14	CO N9
25	–	CLCA 12	542 861	0,58	12	28	38	12	34	9	15	8	22	12	45	52	65	72	2	3,3	10	10
32	–	CLCA 16	542 862	0,97	16	36	46	16	40	11	18	8	27	16	55	65	80	90	3,5	4,3	10	10
40	–	CLCA 20	542 863	1,65	20	45	57	20	45	11	18	10	30	20	70	75	95	100	7,5	4,3	10	16
50	–	CLCA 25	542 864	3,0	25	56	68	25	55	13,5	20	10	37	25	85	90	115	120	10	5,4	10	25
63	50	CLCA 32	542 865	5,0	32	70	86	32	65	17,5	26	13	43	32	110	110	145	145	14,5	5,4	6	25
80	63	CLCA 40	542 866	9,6	40	90	109	40	76	22	33	16	52	40	125	140	170	185	17,5	8,4	6	36
100	80	CLCA 50	542 867	15,5	50	110	132	50	95	26	40	19	65	50	150	165	200	215	25	8,4	–	35
125	100	CLCA 63	542 868	27,5	63	140	165	63	112	33	48	20	75	63	170	210	230	270	33	11,4	–	50
160	125	CLCA 80	542 869	47,0	80	170	200	80	140	39	57	26	95	80	210	250	280	320	45	11,4	–	50

Lampiran D-6, Data mounting block silinder hidrolik, disadur dari kataloq Hidraulic cylinders, Mannesmann Rexroth, hal 23.

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MANNESMANN REXROTH

Synchronising Cylinder, Type CG 250 F
Foot Mounted

17 368/07.90

Replaces: 08.85

Piston dia. 40 mm to 320 mm | up to 250 bar

Designed to give a high degree of reliability, even in critical operating conditions.

Servicing can be carried out with ease; cylinder head and cap are flange mounted and sealing elements are easily accessible.

Adjustable end position cushioning using adjustable throttle valve.

Return travel assisted by means of check valve with bleed screw.

Piston rod - 3 materials available.

This cylinder meets the requirements of the iron and steel industry.

Main dimensions correspond to DIN ISO 3320

K3451/4

Differential cylinder CD 250 F..A 1X/..

K3450/7

Synchronising cylinder CG 250 F..A 1X/..

Ordering Code

| | 250 | F | / | – | | 1X / | | | | | | *

Differential cylinder = CD
Synchronising cylinder = CG

Piston dia Ø	Piston rod dia.	Area ratios φ	
40	20	1,3 : 1	= 40/ 20
	28	2 : 1	= 40/ 28
50	28	1,4 : 1	= 50/ 28
	36	2 : 1	= 50/ 36
63	36	1,4 : 1	= 63/ 36
	45	2 : 1	= 63/ 45
80	45	1,4 : 1	= 80/ 45
	56	2 : 1	= 80/ 56
100	56	1,4 : 1	= 100/ 56
	70	2 : 1	= 100/ 70
125	70	1,4 : 1	= 125/ 70
	90	2 : 1	= 125/ 90
140	90	1,6 : 1	= 140/ 90
	100	2 : 1	= 140/100
160	100	1,6 : 1	= 160/100
	110	2 : 1	= 160/110
180	110	1,6 : 1	= 180/110
	125	2 : 1	= 180/125
200	125	1,6 : 1	= 200/125
	140	2 : 1	= 200/140
220	140	1,6 : 1	= 220/140
	160	2 : 1	= 220/160
250	160	1,6 : 1	= 250/160
	180	2 : 1	= 250/180
280	180	1,6 : 1	= 280/180
	200	2 : 1	= 280/200
320	200	1,6 : 1	= 320/200
	220	2 : 1	= 320/220

Further details to be stated in text

Seals
A = Chevron seal kits
T = slice ring for low friction operation

M = NBR seals, suitable for mineral oils to DIN 51524 (HL, HLP)
V = FPM (Viton) seals, suitable for phosphate ester (HFD-R)

U = without end position cushioning
K = cushioning at blank end
S = cushioning at head end
D = end position cushioning, both sides

G = threads for spherical rod end CGA and CGAK, plain rod end CSA
A = threads for spherical rod end CGAS
} see dimensions pages 2 - 8 and RE 17050

Piston rod material
C = Ck 45, hard chrome plated
H = Ck 53, hardened and hard chrome plated, available for piston rod dia. ≤ 110
N = Ck 45, chemical nickel plate, hard chrome plated

01 = BSP threads to ISO 228/1
02 = metric ISO threads

1X = Series 10 to 19
(10 - 19 ≙ installation and connect. dimens. remain the same)

A = screwed construction at both cylinder ends
B = welded construction at cylinder cap and screwed construction at cylinder head, up to piston dia. ≤ 100

750 = 750 mm (give stroke length in mm)

Lampiran D-7, Data ordering code silinder hidrolik, disadur dari kataloq Hidraulic cylinders, Mannesmann Rexroth, hal 285.

Technical Da

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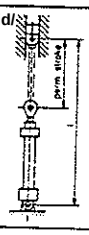
Permissible stroke in mm for buckling stress (compressure load) according to the Euler formula, 3.5 safety factor and with pivoted and rigidly guided load.

Case 2
(basic case)
two ends pivoted
(and rigidly guided)



$s_K \approx l$

Piston dia. (mm)	Piston rod dia. (mm)	Operating pressure in bar				
		50	100	150	200	250
		Permissible stroke in mm				
40	20	280	155	95	65	40
	28	690	445	335	270	225
50	28	510	315	225	160	140
	36	950	625	480	395	335
63	36	700	440	325	256	210
	45	1195	790	610	505	435
80	45	880	560	420	335	280
	56	1480	985	765	635	545
100	56	1105	710	535	430	360
	70	1865	1245	970	810	695
125	70	1400	905	685	555	465
	90	2500	1680	1320	1105	960
140	90	2170	1440	1115	925	795
	100	2755	1855	1455	1215	1055
160	100	2330	1540	1190	985	840
	110	2805	1940	1520	1265	1095
180	110	2480	1635	1260	1035	885
	125	3325	2230	1745	1455	1260
200	125	2920	1935	1500	1240	1065
	140	3775	2540	1995	1670	1445
220	140	3325	2205	1705	1410	1205
	160	4500	3030	2380	1995	1730
250	160	3880	2590	2015	1675	1445
	180	5055	3415	2690	2260	1965
280	180	4380	2925	2275	1890	1630
	200	5550	3750	2950	2475	2150
320	200	4680	3105	2410	1995	1710
	220	5810	3905	3060	2560	2215

Lampiran D-9, Data Panjang langkah yang diijinkan untuk silinder hidrolik, disadur dari kataloq Hidraulic cylinders, Mannesmann Rexroth, hal 246.

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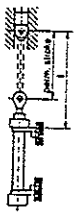
Technical Data

Permissible stroke in mm according to the Euler formula, 3.5 safety factor and with pivoted and rigidly guided load.

Case 3

one end pivoted
(and rigidly guided),
one end ridigly fixed

$s_k = l \cdot \sqrt{\frac{1}{2}}$



Piston dia. (mm)	Piston rod dia. (mm)	Operating pressure in bar				
		50	100	150	200	250
		Permissible stroke in mm				
40	20	1115	760	605	510	445
	28	2285	1590	1280	1095	965
50	28	1795	1235	990	840	740
	36	3040	2115	1705	1465	1295
63	36	2370	1635	1315	1120	990
	45	3780	2635	2125	1825	1615
80	45	2935	2035	1635	1395	1235
	56	4625	3230	2610	2240	1990
100	56	3630	2515	2020	1725	1520
	70	5780	4030	3255	2795	2480
125	70	4555	3155	2535	2165	1915
	90	7670	5360	4335	3725	3310
140	90	6795	4735	3820	3275	2905
	100	8450	5900	4775	4100	3640
160	100	7375	5100	4110	3525	3120
	110	8925	6230	5035	4320	3835
180	110	7850	5455	4390	3760	3330
	125	10215	7140	5770	4950	4390
200	125	9145	6360	5130	4395	3890
	140	11565	8075	6525	5605	4975
220	140	10435	7255	5850	5010	4440
	160	13750	9600	7765	6670	5920
250	160	12040	8390	6775	5810	5155
	180	15365	10730	8685	7465	6630
280	180	13610	9485	7660	6570	5825
	200	16915	11825	9565	8220	7305
320	200	14615	10160	8185	7010	6205
	220	17810	12420	10030	8605	7635

Lampiran D-10, Data Panjang langkah yang diijinkan untuk silinder hidrolik, disadur dari kataloq Hidraulic cylinders, Mannesmann Rexroth, hal 294.

MANNESMANN REXROTH
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Type G2, Series 4X

Sizes 4 to 22	... 250 bar	... 22.4 cm³/rev	RE 10 030/10.86 Replaces: 6.86

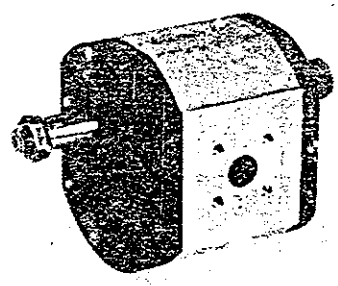
- New principle of sealing the pump body, therefore long service life
- Long seal life even at maximum temperatures
- Plain bearings for high loading
- Single block bearings
- Simple and robust construction
- New principle of hydrostatic side clearance compensation

Hydraulic pumps type G2 are self aspirating external gear pumps. They are used to generate a fluid flow and to impart to this the necessary forces.

They consist basically of the housing (1), mounting flange (2), drive shaft (3), 2 bearing blocks (4), bearing bushes (5), and the plates for hydrostatic compensation of end clearance (6).

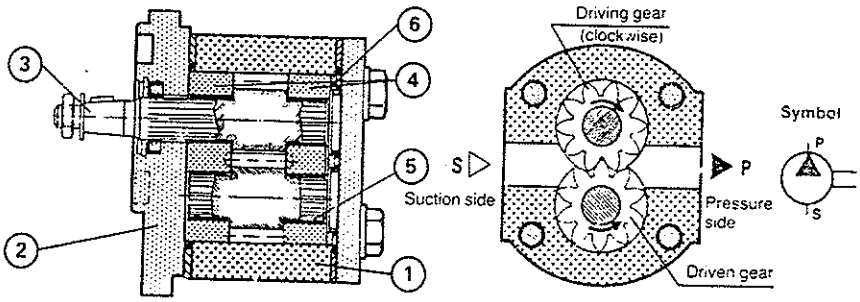
As the gears rotate, and the teeth come clear of the meshing point, a vacuum is created, thus allowing atmospheric pressure acting on the fluid surface within the tank to cause fluid to flow into the spaces between the teeth, within which it is then carried in the direction of the arrows (see section), from the suction to the pressure side.

As the teeth mesh once more, the fluid is forced out of the spaces between the teeth into the output port of the pump, as the meshing of the teeth prevents it from returning to the suction side.



K 3603/1
1 PF 2 G2-4X/...C 20 KP

In order to prevent harsh running of the pump, small grooves are cut into the side plates to allow fluid trapped in the mesh to return to the suction side.



Technical data (For application outside these parameters, please consult us!)

Fluids: Mineral oils to DIN 51 524 (HL and HLP) (other fluids on enquiry)
Please note: The fluid specifications shown in data sheet RE 07075 must be adhered to.

Fluid temperature range: – 15 up to + 80 °C
please consult us for higher temperatures

Ambient temperature range: – 15 up to + 60 °C

Viscosity range: 10 up to 300 mm²/s (recommended)
1000 mm²/s (max. start viscosity)

Filtration: 25 micron (We recommend 10 µm to ensure a long life under heavy loading, continuous duty, or at low viscosities.)

Drive connection: Flexible coupling, for other types of drive, please consult us

Installation position: optional

Direction of rotation: Pumps may only rotate in the direction specified

Weights: see table for individual pump weights

Size	4	5	8	11	14	16	19	22
Capacity in cm³/rev	4	5,5	8,2	11	14,1	16,2	19	22,4
Operating pressure, inlet: absolute pressure – $p_{abs\,min}$ 0.7 bar – $p_{abs\,max}$ 3.0 bar								
max. cont. pressure $p1$ in bar	250	250	250	250	250	240	210	
max. speed at max. cont. pressure $p1$ in rpm	5000	4000	4000	4000	3500	3000	3000	2500
min. speed at p = 180 bar in rpm	1000	1000	700	500	500	500	500	500
min. speed at $p1$ in rpm	1200	1200	1000	700	700	700	700	700

Lampiran D-11, Data pompa hidrolik, disadur dari kataloq Mobile Hidraulic Components, Mannesmann Rexroth, hal 33.

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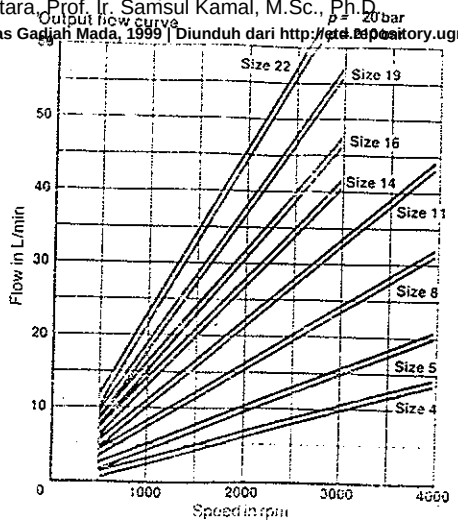
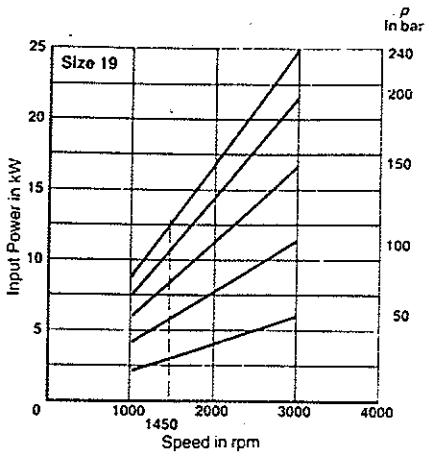


Lampiran D-12, Grafik hubungan kecepatan putar pompa hidrolik terhadap debit fluida, disadur dari kataloq Mobile Hidraulic Components, Mannesmann Rexroth, hal 34.



Lampiran D-13, Grafik hubungan kecepatan putar pompa hidrolik terhadap daya yang dibutuhkan untuk memutar pompa hidrolik, disadur dari kataloq Mobile Hidraulic Components, Mannesmann Rexroth, hal 35.

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CKA30BT TRUCK

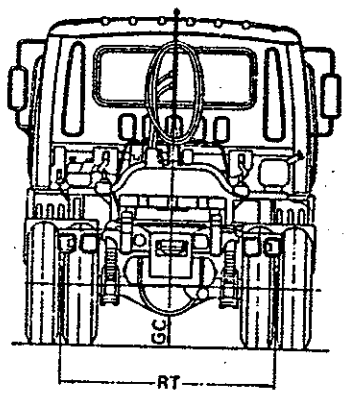
DIMENSIONS		mm (in.)
Wheelbase	(WB)	3150 (124.0)
Overall Length	(OL)	5475 (215.6)
Overall Width	(OW)	2485 (97.8)
Overall Height	(OH)	2910 (114.6)
Front Tread	(FT)	2020 (79.5)
Rear Tread	(RT)	1860 (73.2)
Rear Overhang	(RO)	915 (36.0)
Cab to Rear Axle Center	(CA)	2590 (102.0)
Ground Clearance	(GC)	265 (10.4)
Coupler Offset	(CO)	**(STD) 460 (18.1)
Front Fitting Radius	(FR)	1790 (70.5)
Lower Fitting Radius	(LR)	1520 (59.8)
Bumper to Fifth Wheel		4140 (163.0)
Coupler Height	(CH)	1260 (49.6)

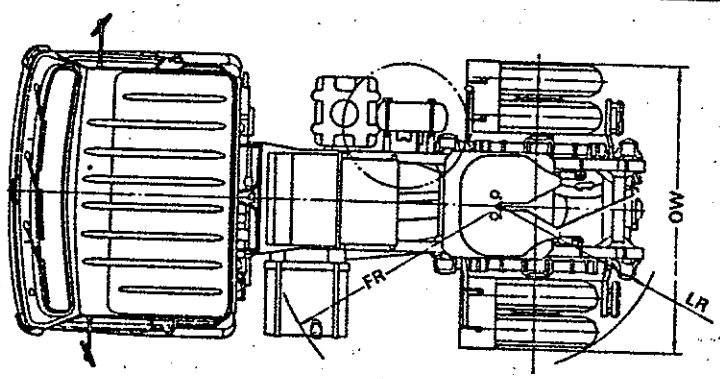
**(STD) 460 (18.1) **(OPT) 380 (15.0), 420 (16.5)

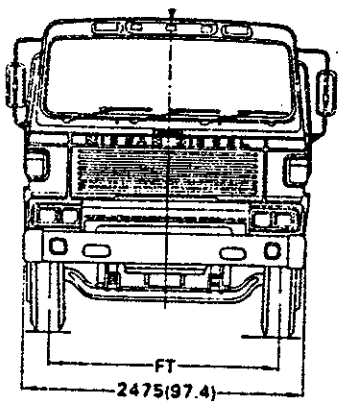
Note: These dimensions and weights are calculated for standard truck tractors fitted with 10.00-20-14 PR tires.
When coupling trailer, the GVW should be less than the permissible tire load indicated in JIS, TRA, DIN, ETRTO or local regulations.

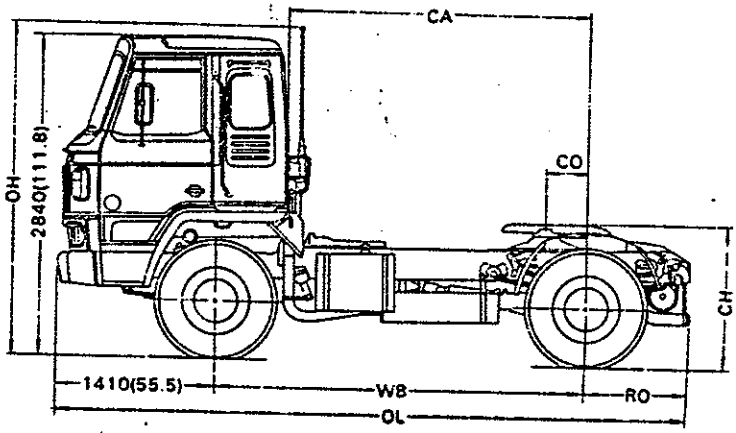
WEIGHTS	kg (lb)
Curb Weight	5475 (12070)
On front wheels	3555 (7837)
On rear wheels	1920 (4233)
Fifth Wheel Load	9500 (20944)
Crew (3 persons)	195 (430)
Gross Vehicle Weight	15170 (33444)
On front wheels	5160 (11376)
On rear wheels	10010 (22068)
Permissible Gross Combination Vehicle Weight	27000 (59524)
	*38000 (83775)

*With double reduction rear axle









Unit: mm (in.)

Lampiran F-1, Spesifikasi Truck Tractor, disadur dari Specification Handbook, Nissan Diesel Motor Co.,Ltd., 1990, Hal 204.

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CKA30BT TRUCK TRACTOR SPECIFICATIONS

PERFORMANCE

Min. Turning Radius 5.7 m (18.7 ft)

Max. Speed and Gradability with 10.00-20 tires

Max. speed km/h (mph)	Gradability (tan θ)	Transmission	Final ratio	GCW kg (lb)
95 (59)	0.225	TMH612 6+2	6.166	27000 (52910)
86 (53)	0.168	TMH602	6.827	38000 (83773)
96 (60)	0.302	RTO116098	6.237	38000 (83773)

Available combinations of transmissions and final gear ratios are shown in the above table.

ENGINE

Make and model		NISSAN DIESEL MOTOR, PE6 DIESEL ENGINE
Type		4-cycle, direct-injection, water-cooled, in-line, diesel engine
Number of Cylinders		6
Bore × Stroke		133 × 140 mm (5.24 × 5.51 in.)
Total Piston Displacement		11670 cc (712 cu in.)
Max. Output (JIS)		230 PS at 2300 rpm
Max. Torque (JIS)		83 kg-m at 1200 rpm
Max. Gross Output (SAE)		234 HP at 2300 rpm
Max. Gross Torque (SAE)		596 lb-ft at 1200 rpm
Compression Ratio		17.6
Lubrication System		Forced feed by gear pump
Cooling System		Forced circulation by centrifugal water pump
Fuel System		
Fuel injection pump		Bosch P-type in line plunger
Governor	(STD)	RQ, mechanical maximum-minimum speed type
	(OPT)	RFD mechanical all speed type
Air Cleaner	(STD)	Donaldson FHG12
	(OPT)	Donaldson FHG16, or oil bath type with stack behind cab
Electrical Equipment		24-volt system, negative earth
Generator	(STD)	24-volt—35 amp. alternator
	(OPT)	24-volt—40 amp. alternator
Cold Starting Aid		Battery-powered intake air heater

CHASSIS

Clutch: Dry single plate, hydraulically operated clutch release mechanism with air-assisted booster

Front Axle: Reverse Elliot "I" beam

Rear Axle

	STD	OPT	
Type	Full-floating, pressed steel banjo housing		
Final reduction gear	Single reduction hypoid gear	Double reduction hypoid and planetary gear	
Final reduction ratio	6.166	6.827	6.237

Steering: Recirculating ball screw type with hydraulic power assistance

Service Brake (foot brake): Full air brake on all wheels, dual air line system, internal expanding leading and trailing shoe type

Parking Brake (hand brake): Mechanically operated by hand brake lever, internal expanding duo-servo shoe type brake acting on drum at rear of transmission

Front springs: Semielliptic leaf springs

Width × length: 90 × 1550 mm (3.5 × 61.0 in.)

	STD	OPT	OPT
Make and model	NISSAN DIESEL MOTOR, TMH612	NISSAN DIESEL MOTOR, TMH602	FULLER RTO116098
Type	Six forward speeds and one reverse, all constant mesh	Six forward speeds and one reverse, synchromesh on 2nd, 3rd, 4th, 5th and 6th gears, constant mesh on 1st and reverse gears	Nine forwards speeds and two reverse, constant mesh on each shift and synchromesh on range shift
Gear ratios 1st	6.847	6.847	Low 12.56 5th 1.95
2nd	4.206	4.206	1st 7.47 6th 1.38
3rd	2.536	2.536	2nd 5.28 7th 1.00
4th	1.553	1.553	3rd 3.82 8th 0.73
5th	1.000	1.000	4th 2.79
6th	0.743	0.743	
Rev	6.521	6.521	(Low) 13.14 (High) 3.43
Gearshift	Mechanical remote control		
P.T.O (optional)	Attached on the left side of gearbox		Not available
Reduction ratio	1.441		
Direction of rotation	Clockwise as seen from rear		

Rear Springs: Semielliptic leaf springs

Width × length: Main 90 × 1600 mm (3.5 × 63.0 in.); Helper 90 × 1170 mm (3.5 × 46.1 in.)

Shock Absorbers: Telescopic type on front axle

Wheels and Tires

Tires: Front: single/rear: dual

(STD) 10.00-20-14 PR

(OPT) 11.00-20-14 PR

Rim and wheel: Pressed steel disc type, 2 pieces, interim rim

(STD) 7.00T × 20, 10 studs

(OPT) 7.50V × 20, 8 or 10 studs, or spoke type

7.00T × 20, 8 studs

Spare wheel: One spare wheel and tire with wind-up wheel carrier

Available combination of wheels and tires

Wheel \ Tire	10.00-20-14 PR	11.00-20-14 PR
7.00T × 20-162	◎	X
7.50V × 20-165	O	O

◎ Standard O: Optional X: Not available

Frame: Ladder type, channel section side member

Dimensions: 250 × 90 × 8 mm (9.8 × 3.5 × 0.3 in.)

Fuel Tank Capacity (STD) 200 ℓ (44.0 imp.gal.)

(OPT) 200 ℓ (44.0 imp gal.) + 200 ℓ (44.0 imp gal.)

Electrical Equipment

Battery (STD) 120 AH, 12-volt × 2

(OPT) 150 AH, 12-volt × 2

Headlights: Sealed beam, 4 lamps, 55W × 2, 50/55W × 2

Others: Taillight, stoplight, license light, side clearance light, turn signal, air horn

TRAILER EQUIPMENT

Coupler (STD) Pitching shaft type for SAE 2-inch dia. kingpin

Lampiran E-2, Spesifikasi Truck Tractor, disadur dari Specification Handbook, Nissan Diesel Motor Co.,Ltd., 1990, Hal 205.

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Perancangan Kendaraan Pengangkut Sedan Dengan Kapasitas Delapan Sedan
Saut Batara, Prof. Ir. Samsul Kamal, M.Sc., Ph.D.
Universitas Gadjah Mada, 1999 | Diunduh dari http://etd.repository.ugm.ac.id/

Brake Connections		SAE sixteen conductor connector with 6.2 m jumper cable and emergency line couplers with 4.2 m jumper hosen
Electrical Connections		SAE seven conductor connector with 6.2 m jumper cable
CAB		
Type		Forward control, all steel welded construction tilting cab
Windshield	(STD)	Safety glass, 6 mm (0.24 in.) thick
	(OPT)	Laminated glass
Instruments		
Meters		Speedometer with odometer, fuel gauge, water temperature gauge, voltmeter, air pressure gauge, oil pressure gauge
Warning lights and buzzers		Low oil and air pressure indicators, hand brake, direction and headlight beam indicators, low air pressure buzzer
ATTACHMENTS		
Tools		NISSAN DIESEL standard tools (1 set)

OTHERS

ITEM	STD	OPT
Spring brake	x	O
Exhaust brake	O	–
Car heater	x	O
Car cooler	x	O
Radiator shutter	x	O
Air dryer	x	O
Cooling water level warning buzzer	x	O
Overheating warning buzzer	x	O
Engine overrunning warning buzzer	x	O
Reverse warning buzzer	x	O
Hazard warning lamp	x	O
Headlights	White	Yellow
Fog lights	Yellow	White
Parking lights	x	O
Passing light	O	–
Beacon lamp	x	O
Top marker lamp	x	O
Tachometer	x	O
Tachograph	x	O
Cigarette lighter	O	With a lamp
AM radio	x	O
Cassette stereo tape player	x	O
Driver's seat	Fixed type	Suspension type
Seat belts	x	O
Sun visor	Driver's side only	Driver's side and assistants' side
Tire inflator	x	O
Rearview mirrors	Convex	Wide convex or western
Intermittent wiper	x	O
Guide block	x	O
Sleeper	x	O
Curtain	x	O
Toolbox	x	O

O Available x Not available

Lampiran E-3, Spesifikasi Truck Tractor, disadur dari Specification Handbook, Nissan Diesel Motor Co.,Ltd., 1990, Hal 205.

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Universitas Gadjah Mada, 1999 | Diunduh dari http://etd.repository.ugm.ac.id/

Bias Ply Tires for Trucks, Buses and Trailers Used in Normal Highway Serv

Tire size	S : Single D : Dual	Max. load per tire (kg) JIS[1]	TRA[2]	ETRTO[3]	Recommended rim (JIS)	Dynamic radius
7.50-16-12 PR	S	1,440		1,425	• 6.00GS x 16	0.38
	D	1,370		1,375		
7.50-16-14 PR	S	1,510				
	D	1,440				
8.25-16-14 PR	S	1,710	1,701	1,800	• 6.50H x 16 6.00GS x 16	0.40
	D	1,630	1,497	1,700		
7.50-18-10 PR	S	1,465	1,492		• 6.00S x 18	0.42
	D	1,395	1,311			
7.50-18-12 PR	S	1,610	1,651			
	D	1,530	1,447			
7.00-20-10 PR	S	1,350	1,429		6.00S x 20	0.43
	D	1,285	1,252			
7.50-20-10 PR	S	1,575	1,601	1,550	• 6.00S x 20	0.44
	D	1,500	1,406	1,475		
7.50-20-12 PR	S	1,735	1,774	1,800		
	D	1,650	1,556	1,725		
8.25-20-12 PR	S	1,940	2,041	1,875	• 6.50T x 20 6.00S x 20	0.46
	D	1,845	1,792	1,775		
8.25-20-14 PR	S	2,030	2,232	2,050		
	D	1,930	1,960	1,925		
9.00-20-12 PR	S	2,255	2,336	2,240	• 7.00T x 20 6.50T x 20	0.49
	D	2,145	2,050	2,060		
9.00-20-14 PR	S	2,415	2,572	2,500		
	D	2,300	2,254	2,300		
10.00-20-12 PR	S	2,450	2,463		• 7.50V x 20 8.00V x 20 7.00T x 20	0.50
	D	2,210	2,159			
10.00-20-14 PR	S	2,700	2,740	2,630		
	D	2,425	2,404	2,373		
10.00-20-16 PR	S	(3,000)	2,998	3,000		
	D	(2,700)	2,631	2,700		
11.00-20-12 PR	S	2,585	2,685		• 8.00V x 20 8.50V x 20 7.50V x 20	0.52
	D	2,435	2,354			
11.00-20-14 PR	S	2,840	2,989	3,000		
	D	2,670	2,622	2,700		
11.00-20-16 PR	S	(3,100)	3,266	3,250		
	D	(2,785)	2,867	2,875		
12.00-20-14 PR	S	2,900	3,175	2,900	• 8.50V x 20 9.00V x 20 8.00V x 20	0.53
	D	2,760	2,785	2,625		
12.00-20-16 PR	S	3,115	3,511	3,300		
	D	2,965	3,080	2,950		
12.00-20-18 PR	S	3,250	3,724	3,750		
	D	3,095	3,266	3,250		

1. Japanese Industrial Standards
2. The Tire and Rim Association Inc. (Tire standards of U.S.A.)
3. The European Tire and Rim Technical Organization (Integrated tire standards in Europe)

• Best su

Lampiran E-4, Data pemilihan ban pada semi trailer.

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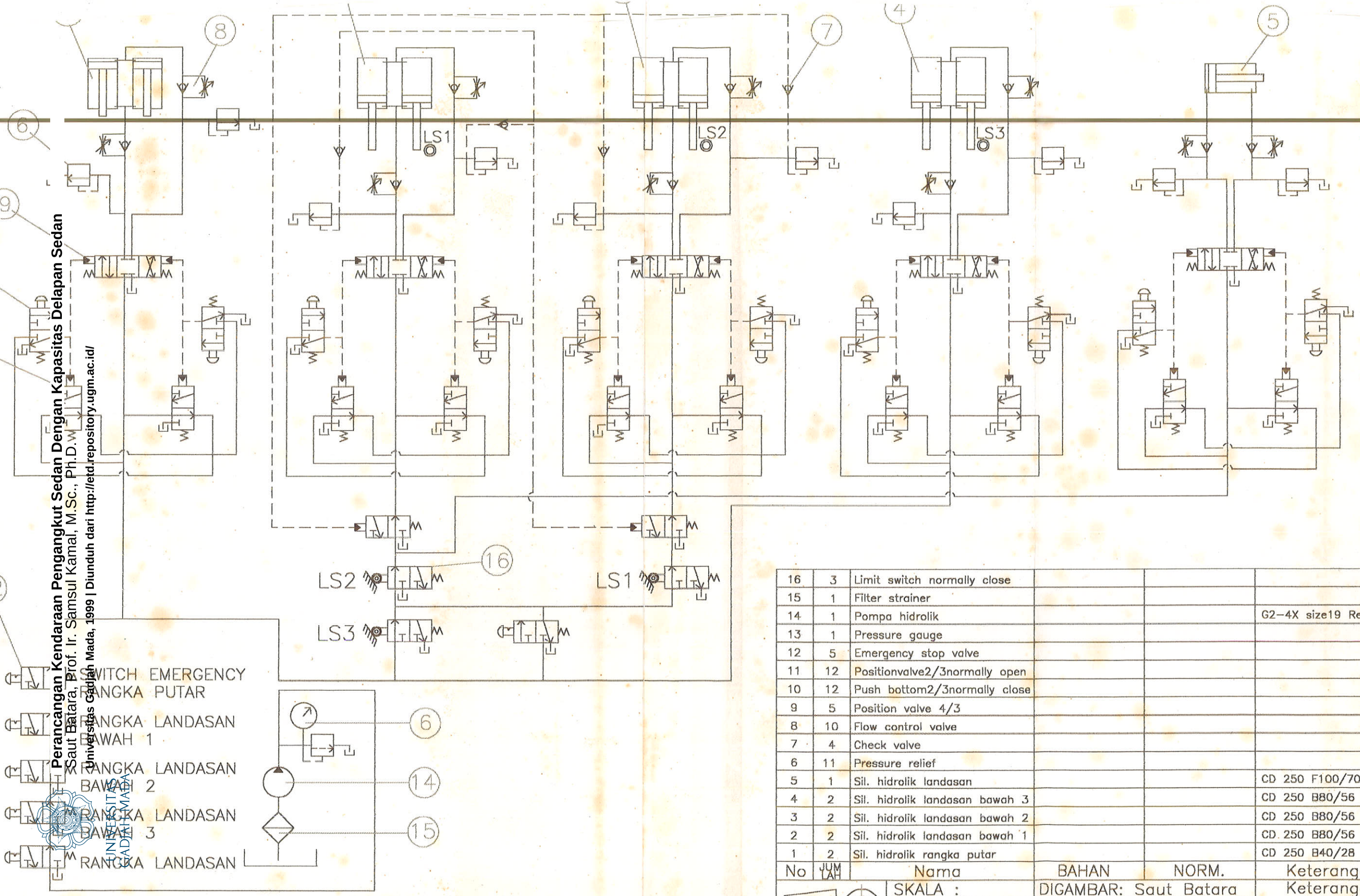

No	JUMLAH	Nama	BAHAN	NORM.	Keterangan
16	3	Limit switch normally close			
15	1	Filter strainer			
14	1	Pompa hidrolik			G2–4X size19 Rexroth
13	1	Pressure gauge			
12	5	Emergency stop valve			
11	12	Positionvalve2/3normally open			
10	12	Push bottom2/3normally close			
9	5	Position valve 4/3			
8	10	Flow control valve			
7	4	Check valve			
6	11	Pressure relief			
5	1	Sil. hidrolik landasan			CD 250 F100/70 248(
4	2	Sil. hidrolik landasan bawah 3			CD 250 B80/56 545
3	2	Sil. hidrolik landasan bawah 2			CD 250 B80/56 545
2	2	Sil. hidrolik landasan bawah 1			CD 250 B80/56 545
1	2	Sil. hidrolik rangka putar			CD 250 B40/28 225

SKALA :	DIGAMBAR: Saut Batara	Keterangan
SATUAN:	NIM : 21287/TM	
TGL :JUL–99	DIPERIKSA: Dr.Ir.Samsul.K	

TEKNIKMESIN FT.UGM	DIAGRAM SISTIM HIDROLIK	NO.2	A