BAB V

KESIMPULAN DAN SARAN

5.1. Kesimpulan

Dari analisis struktur mengabaikan tulangan dan analisis memperhitungkan tulangan, diberikan beberapa kesimpulan antara lain:

1. Selisih perbandingan nilai gaya aksial ekstrim dari analisis struktur mengabaikan tulangan bernilai lebih kecil dibanding dengan tulangan diperhitungkan. Penyimpangan ini berkisar antara 0,388 % hingga 2,336 %. Selisih yang kecil ini belum perlu diperhitungkan dalam perencanaan dimensi struktur beton bertulang.
2. Untuk momen ekstrim negatif dari berbagai macam bentuk struktur memberikan nilai yang lebih kecil untuk analisis mengabaikan tulangan, jika dibanding dengan memperhitungkan tulangan dalam analisis. Selisih nilai momen ekstrim negatif antara 13,736 % hingga 14,741 %, perlu mendapat perhatian dalam perencanaan dimensi dan penulangan struktur beton bertulang.
3. Perbandingan nilai momen positif ekstrim menunjukkan nilai yang lebih besar untuk analisis mengabaikan tulangan. Penyimpangan yang terjadi cukuplah besar, berkisar antara 14,675 % hingga 34,470 %. Perbedaan yang cukup besar ini tentu saja perlu mendapat perhatikan. Namun bila

analisis mengabaikan tulangan lazim digunakan, maka nilai yang lebih besar ini akan memberikan struktur yang jauh lebih aman.

4. Penyimpangan yang sangat besar juga terjadi dalam analisis. Penyimpangan sebesar 669,718 % bahkan hingga mencapai 8562,5 %, terjadi pada selisih nilai momen positif. Namun selisih yang sangat besar ini, tidak terjadi pada momen positif ektrim sebagai nilai yang menentukan.

5.2. Saran

Untuk memaksimalkan penelitian ini, perlu diberikan beberapa saran untuk menyempurnakan penelitian, antara lain:

1. Analisis struktur perlu diperhitungkan balok ditengah bentang sebagai balok T
2. Untuk perhitungan struktur kolom transformasi dapat diperhitungkan terhadap adanya eksentrisitas.
3. Kombinasi bentuk penampang kolom maupun balok yang bervariasi sekiranya dapat digunakan untuk penelitian lebih lanjut.
4. Kombinasi beban yang mengikut sertakan beban gempa, beban angin, dan beban lainnya, berguna untuk analisis struktur yang umum.
5. Analisis struktur menggunakan program SAP 90, sehingga tidak tertutup kemungkinan digunakan program-program analisis struktur yang lebih valid dan akurat.

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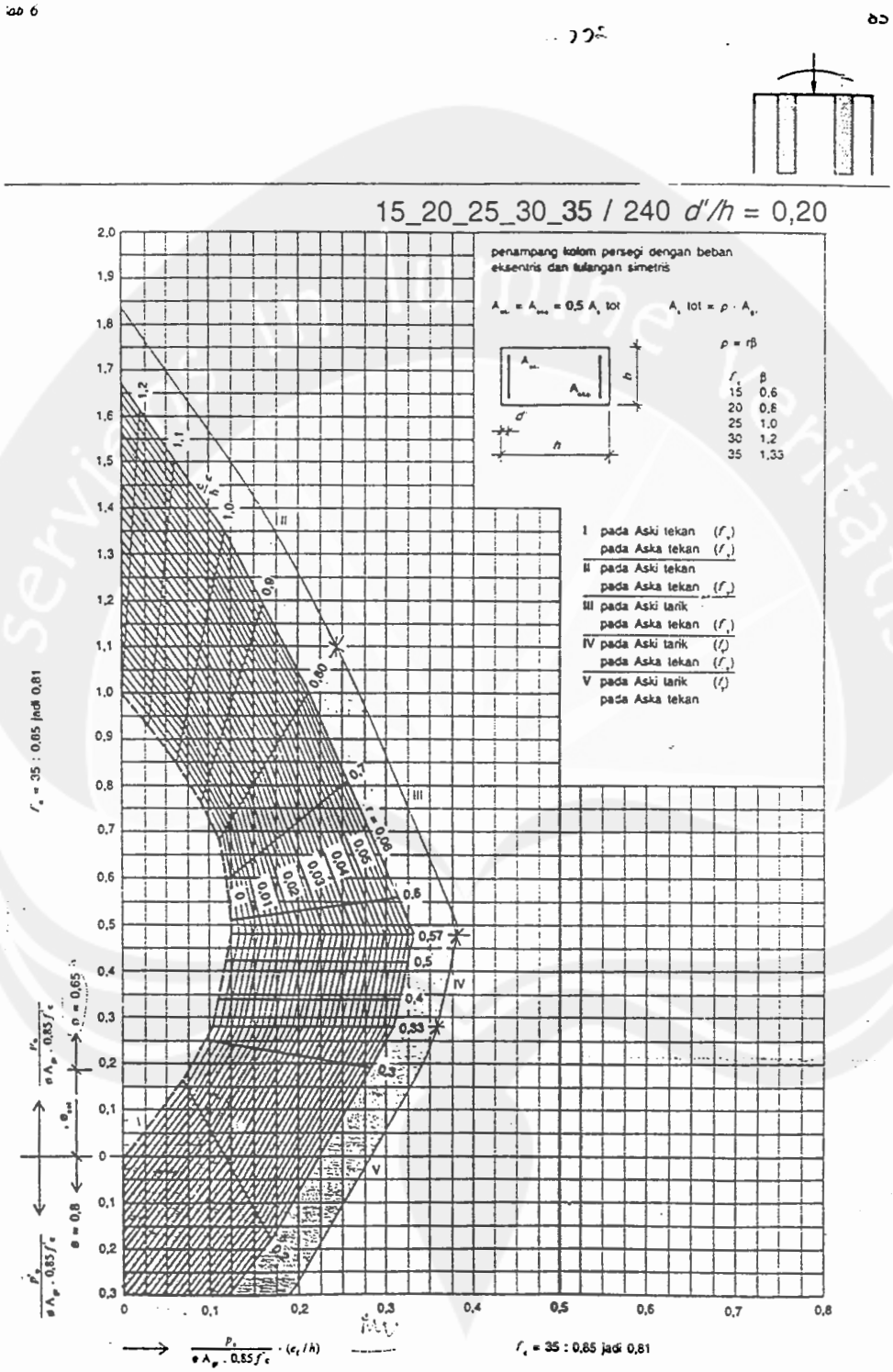
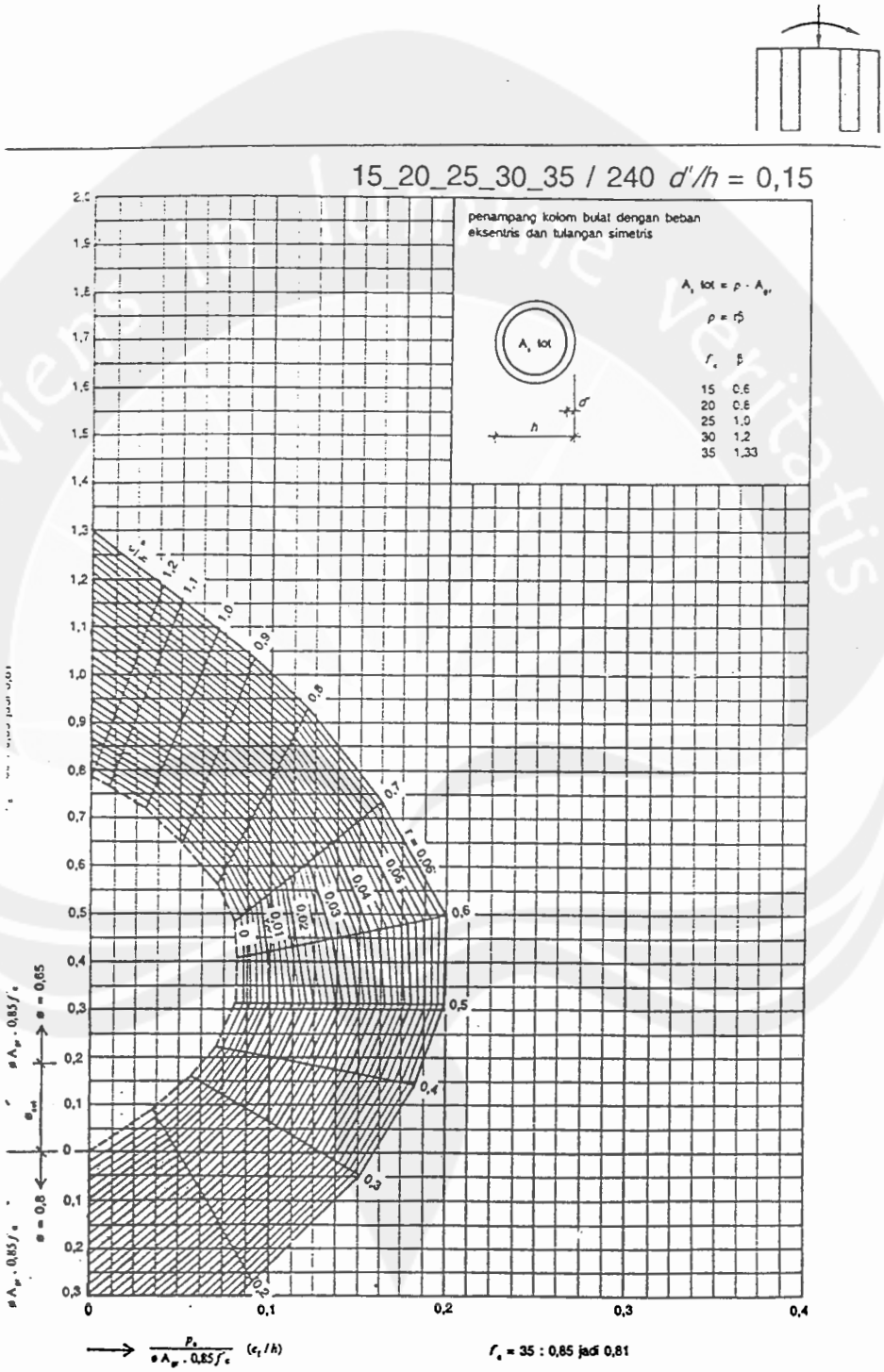
Lampiran 1. Grafik untuk kolom persegi dengan tulangan pada dua sisi kolom



Gambar 6.1.c

Lampiran 2. Grafik untuk kolom bulat dengan tulangan disebar merata



Gambar 6.3.b

Lampiran 3. Input analisis S1-1 dengan SAP 90

```
Struktur 1-1

SYSTEM
L=2

JOINTS
1   x=0      y=0     z=0       : bidang koordinat X-Y
2   x=0      y=3
5   x=3.75   y=3           g=2,5,1
6   x=5      y=0
8   x=5      y=6           g=6,8,1
9   x=6.25   y=3
10  x=6.25   y=6
11  x=7.5    y=3
12  x=7.5    y=6
13  x=8.75   y=3
14  x=8.75   y=6
15  x=10     y=0
18  x=10     y=9           g=15,18,1
19  x=11.25  y=3
21  x=11.25  y=9           g=19,21,1
22  x=12.5   y=3
24  x=12.5   y=9           g=22,24,1
25  x=13.75  y=3
27  x=13.75  y=9           g=25,27,1
28  x=15     y=0
31  x=15     y=9           g=28,31,1

RESTRAINTS
1,31,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
6       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
15      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
28      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y

FRAME
NM=2   NL=4      Y=-1,0
C PROPERTIES POTONGAN
1  SH=R T=0.30,0.30  E=2.35E7 W=0.3*0.3*24  : MATERIAL KOLOM
2  SH=R T=0.4,0.20  E=2.35E7                : MATERIAL BALOK
C BEBAN MATI
1  WG=0,-20.42,0
2  WG=0,-12.168,0
C BEBAN HIDUP
3  WG=0,-7.835,0
4  WG=0,-3.134,0
C KOLOM
1,1,2       M=1    LP=1,0
2,6,7            G=1,3,1,1
3,15,16          G=1,3,1,1
4,28,29          G=1,3,1,1
```

```
8,17,18          G=1,1,13,13
C BALOK
10,2,3      M=2  G=2,1,1,1  NSL=2,4
13,5,7                      NSL=2,4
14,7,9           G=2,1,2,2  NSL=1,3
17,13,16         G=3,1,3,3  NSL=1,3
21,25,29                    NSL=1,3
22,8,10          G=2,1,2,2  NSL=2,4
25,14,17                    NSL=2,4
26,17,20         G=2,1,3,3  NSL=1,3
29,26,30                    NSL=1,3
30,18,21         G=2,1,3,3  NSL=2,4
33,27,31                    NSL=2,4

COMBO
1 C=1
2 C=0,1
3 C=1.2,1.6
4 C=1.05,0.65
```

Struktur 1-1

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

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE
1					
	1	0.000			-33.136
		0.000	-6.367	6.150	
		3.000	-6.367	-12.952	
		3.000			-26.656
	2	0.000			-6.588
		0.000	-1.554	1.563	
		3.000	-1.554	-3.098	
		3.000			-6.588
	3	0.000			-50.303
		0.000	-10.126	9.880	
		3.000	-10.126	-20.499	
		3.000			-42.527
	4	0.000			-39.075
		0.000	-7.695	7.473	
		3.000	-7.695	-15.613	
		3.000			-32.271
2					
	1	0.000			-125.601
		0.000	-0.373	0.309	
		3.000	-0.373	-0.810	
		3.000			-119.120
	2	0.000			-35.291
		0.000	-0.940	0.974	
		3.000	-0.940	-1.847	
		3.000			-35.291
	3	0.000			-207.186
		0.000	-1.952	1.928	
		3.000	-1.952	-3.927	
		3.000			-199.410
	4	0.000			-154.820
		0.000	-1.003	0.957	
		3.000	-1.003	-2.051	
		3.000			-148.016
3					
	1	0.000			-243.295
		0.000	-0.228	0.151	
		3.000	-0.228	-0.533	
		3.000			-236.815
	2	0.000			-78.075
		0.000	-0.011	0.057	
		3.000	-0.011	0.024	
		3.000			-78.075
	3	0.000			-416.874
		0.000	-0.291	0.272	
		3.000	-0.291	-0.601	
		3.000			-409.098
	4	0.000			-306.208
		0.000	-0.247	0.196	
		3.000	-0.247	-0.544	
		3.000			-299.404
4					
	1	0.000			-145.109
		0.000	6.969	-6.972	
		3.000	6.969	13.934	
		3.000			-138.629
	2	0.000			-44.581
		0.000	2.504	-2.437	
		3.000	2.504	5.076	
		3.000			-44.581
	3	0.000			-245.460
		0.000	12.369	-12.265	
		3.000	12.369	24.843	
		3.000			-237.684
	4	0.000			-181.342
		0.000	8.945	-8.904	
		3.000	8.945	17.930	
		3.000			-174.538

5				
1	0.000			-33.985
	0.000	-8.321	9.652	
	3.000	-8.321	-15.311	
	3.000			-27.505
2	0.000			-6.920
	0.000	-2.707	3.944	
	3.000	-2.707	-4.178	
	3.000			-6.920
3	0.000			-51.855
	0.000	-14.317	17.894	
	3.000	-14.317	-25.058	
	3.000			-44.079
4	0.000			-40.183
	0.000	-10.497	12.699	
	3.000	-10.497	-18.792	
	3.000			-33.379
6				
1	0.000			-131.274
	0.000	-2.756	4.147	
	3.000	-2.756	-4.121	
	3.000			-124.794
2	0.000			-37.197
	0.000	-1.704	2.030	
	3.000	-1.704	-3.083	
	3.000			-37.197
3	0.000			-217.043
	0.000	-6.034	8.225	
	3.000	-6.034	-9.877	
	3.000			-209.267
4	0.000			-162.016
	0.000	-4.002	5.674	
	3.000	-4.002	-6.331	
	3.000			-155.212
7				
1	0.000			-90.921
	0.000	11.077	-16.772	
	3.000	11.077	16.459	
	3.000			-84.441
2	0.000			-26.398
	0.000	4.412	-6.521	
	3.000	4.412	6.714	
	3.000			-26.398
3	0.000			-151.342
	0.000	20.351	-30.561	
	3.000	20.351	30.493	
	3.000			-143.566
4	0.000			-112.626
	0.000	14.499	-21.850	
	3.000	14.499	21.646	
	3.000			-105.822
8				
1	0.000			37.363
	0.000	-10.701	12.832	
	3.000	-10.701	-19.273	
	3.000			-30.883
2	0.000			-7.970
	0.000	-3.408	4.908	
	3.000	-3.408	-5.316	
	3.000			-7.970
3	0.000			-57.587
	0.000	-18.295	23.250	
	3.000	-18.295	-31.633	
	3.000			-49.811
4	0.000			-44.411
	0.000	-13.452	16.663	
	3.000	-13.452	-23.692	
	3.000			-37.607
9				
1	0.000			-36.437
	0.000	10.701	-15.145	
	3.000	10.701	16.959	
	3.000			-29.957

2	0.000			-7.700
	0.000	3.408	-5.583	
	3.000	3.408	4.641	
	3.000			-7.700
3	0.000			-56.045
	0.000	18.295	-27.407	
	3.000	18.295	27.777	
	3.000			-48.269
4	0.000			-43.264
	0.000	13.452	-19.531	
	3.000	13.452	20.824	
	3.000			36.460
10				
1	0.000			-6.367
	0.000	26.656	-12.952	
	1.250	11.446	10.861	
	1.250			-6.367
2	0.000			-1.554
	0.000	6.588	-3.098	
	1.250	2.670	2.689	
	1.250			-1.554
3	0.000			-10.126
	0.000	42.527	-20.499	
	1.250	18.007	17.335	
	1.250			-10.126
4	0.000			-7.695
	0.000	32.271	-15.613	
	1.250	13.754	13.152	
	1.250			-7.695
11				
1	0.000			-6.367
	0.000	11.446	10.861	
	0.941	0.000	16.244	
	1.250	-3.764	15.662	
	1.250			-6.367
2	0.000			-1.554
	0.000	2.670	2.689	
	0.852	0.000	3.826	
	1.250	-1.247	3.578	
	1.250			-1.554
3	0.000			-10.126
	0.000	18.007	17.335	
	0.918	0.000	25.601	
	1.250	-6.513	24.520	
	1.250			-10.126
4	0.000			-7.695
	0.000	13.754	13.152	
	0.928	0.000	19.537	
	1.250	4.763	18.771	
	1.250			-7.695
12				
1	0.000			-6.367
	0.000	-3.764	15.662	
	1.250	18.974	1.450	
	1.250			-6.367
2	0.000			-1.554
	0.000	-1.247	3.578	
	1.250	-5.165	-0.429	
	1.250			-1.554
3	0.000			-10.126
	0.000	-6.513	24.520	
	1.250	-31.033	1.054	
	1.250			-10.126
4	0.000			-7.695
	0.000	-4.763	18.771	
	1.250	-23.280	1.244	
	1.250			-7.695
13				
1	0.000			-6.367
	0.000	-18.974	1.450	
	1.250	-34.184	-31.774	
	1.250			-6.367
2	0.000			-1.554
	0.000	-5.165	-0.429	

	1.250	-9.082	-9.333	
	1.250			-1.554
3	0.000			-10.126
	0.000	-31.033	1.054	
	1.250	-55.553	-53.062	
	1.250			-10.126
4	0.000			-7.695
	0.000	-23.280	1.244	
	1.250	-41.797	-39.429	
	1.250			-7.695

14 ----------

1	0.000			1.581
	0.000	50.951	-42.237	
	1.250	25.426	5.498	
	1.250			1.581
2	0.000			0.214
	0.000	19.289	-15.124	
	1.250	9.495	2.866	
	1.250			0.214
3	0.000			2.239
	0.000	92.003	-74.883	
	1.250	45.703	11.184	
	1.250			2.239
4	0.000			1.799
	0.000	66.036	-54.180	
	1.250	32.869	7.636	
	1.250			1.799

15 ----------

1	0.000			1.581
	0.000	25.426	5.498	
	1.250	-0.099	21.328	
	1.250			1.581
2	0.000			0.214
	0.000	9.495	2.866	
	1.212	0.000	8.620	
	1.250	-0.299	8.614	
	1.250			0.214
3	0.000			2.239
	0.000	45.703	11.184	
	1.250	-0.597	39.375	
	1.250			2.239
4	0.000			1.799
	0.000	32.869	7.636	
	1.250	-0.298	27.993	
	1.250			1.799

16 ----------

1	0.000			1.581
	0.000	-0.099	21.328	
	1.250	-25.624	5.251	
	1.250			1.581
2	0.000			0.214
	0.000	-0.299	8.614	
	1.250	-10.092	2.119	
	1.250			0.214
3	0.000			2.239
	0.000	-0.597	39.375	
	1.250	-46.897	9.692	
	1.250			2.239
4	0.000			1.799
	0.000	-0.298	27.993	
	1.250	-33.465	6.891	
	1.250			1.799

17 ----------

1	0.000			1.581
	0.000	-25.624	5.251	
	1.250	-51.149	-42.733	
	1.250			1.581
2	0.000			0.214
	0.000	-10.092	2.119	
	1.250	-19.886	-16.617	
	1.250			0.214
3	0.000			2.239
	0.000	-46.897	9.692	

	1.250	-93.197	-77.867	
	1.250			2.239
4	0.000			1.799
	0.000	-33.465	6.891	
	1.250	-66.633	-55.671	
	1.250			1.799
18				
1	0.000			4.109
	0.000	54.391	-47.414	
	1.250	28.866	4.623	
	1.250			4.109
2	0.000			1.907
	0.000	20.993	-18.623	
	1.250	11.199	1.497	
	1.250			1.907
3	0.000			7.982
	0.000	98.858	-86.693	
	1.250	52.558	7.942	
	1.250			7.982
4	0.000			5.554
	0.000	70.756	-61.889	
	1.250	37.589	5.827	
	1.250			5.554
19				
1	0.000			4.109
	0.000	28.866	4.623	
	1.250	3.341	24.753	
	1.250			4.109
2	0.000			1.907
	0.000	11.199	1.497	
	1.250	1.405	9.374	
	1.250			1.907
3	0.000			7.982
	0.000	52.558	7.942	
	1.250	6.258	44.702	
	1.250			7.982
4	0.000			5.554
	0.000	37.589	5.827	
	1.250	4.422	32.083	
	1.250			5.554
20				
1	0.000			4.109
	0.000	3.341	24.753	
	0.164	0.000	25.026	
	1.250	-22.184	12.976	
	1.250			4.109
2	0.000			1.907
	0.000	1.405	9.374	
	0.179	0.000	9.500	
	1.250	-8.389	5.009	
	1.250			1.907
3	0.000			7.982
	0.000	6.258	44.702	
	0.169	0.000	45.230	
	1.250	-40.042	23.587	
	1.250			7.982
4	0.000			5.554
	0.000	4.422	32.083	
	0.167	0.000	32.452	
	1.250	-28.745	16.881	
	1.250			5.554
21				
1	0.000			4.109
	0.000	-22.184	12.976	
	1.250	-47.709	-30.706	
	1.250			4.109
2	0.000			1.907
	0.000	-8.389	5.009	
	1.250	-18.182	-11.598	
	1.250			1.907
3	0.000			7.982
	0.000	-40.042	23.587	
	1.250	-86.342	-55.404	
	1.250			7.982

	4	0.000			5.554
		0.000	-28.745	16.881	
		1.250	-61.913	-39.780	
		1.250			5.554
22					
	1	0.000			-8.321
		0.000	27.505	-15.311	
		1.250	12.295	9.564	
		1.250			-8.321
	2	0.000			-2.707
		0.000	6.920	-4.178	
		1.250	3.003	2.024	
		1.250			-2.707
	3	0.000			-14.317
		0.000	44.079	-25.058	
		1.250	19.559	14.715	
		1.250			-14.317
	4	0.000			-10.497
		0.000	33.379	-18.792	
		1.250	14.862	11.358	
		1.250			-10.497
23					
	1	0.000			-8.321
		0.000	12.295	9.564	
		1.010	0.000	15.776	
		1.250	-2.915	15.427	
		1.250			-8.321
	2	0.000			-2.707
		0.000	3.003	2.024	
		0.958	0.000	3.462	
		1.250	-0.915	3.329	
		1.250			-2.707
	3	0.000			-14.317
		0.000	19.559	14.715	
		0.997	0.000	24.466	
		1.250	-4.961	23.838	
		1.250			-14.317
	4	0.000			-10.497
		0.000	14.862	11.358	
		1.003	0.000	18.813	
		1.250	-3.655	18.362	
		1.250			-10.497
24					
	1	0.000			-8.321
		0.000	-2.915	15.427	
		1.250	18.125	2.277	
		1.250			-8.321
	2	0.000			-2.707
		0.000	-0.915	3.329	
		1.250	-4.832	-0.263	
		1.250			-2.707
	3	0.000			-14.317
		0.000	-4.961	23.838	
		1.250	-29.481	2.311	
		1.250			-14.317
	4	0.000			-10.497
		0.000	-3.655	18.362	
		1.250	-22.172	2.220	
		1.250			-10.497
25					
	1	0.000			-8.321
		0.000	-18.125	2.277	
		1.250	-33.335	-29.885	
		1.250			-8.321
	2	0.000			-2.707
		0.000	-4.832	-0.263	
		1.250	-8.750	-8.752	
		1.250			-2.707
	3	0.000			-14.317
		0.000	-29.481	2.311	
		1.250	-54.001	-49.866	
		1.250			-14.317
	4	0.000			-10.497
		0.000	-22.172	2.220	

		1.250	-40.689	-37.068
		1.250		
26				
	1	0.000		
		0.000	54.097	-46.837
		1.250	28.572	4.830
		1.250		
	2	0.000		
		0.000	20.477	-16.743
		1.250	10.683	2.732
		1.250		
	3	0.000		
		0.000	97.679	-82.993
		1.250	51.379	10.167
		1.250		
	4	0.000		
		0.000	70.111	-60.062
		1.250	36.944	6.847
		1.250		
27				
	1	0.000		
		0.000	28.572	4.830
		1.250	3.047	24.592
		1.250		
	2	0.000		
		0.000	10.683	2.732
		1.250	0.889	9.965
		1.250		
	3	0.000		
		0.000	51.379	10.167
		1.250	5.079	45.453
		1.250		
	4	0.000		
		0.000	36.944	6.847
		1.250	3.777	32.298
		1.250		
28				
	1	0.000		
		0.000	3.047	24.592
		0.149	0.000	24.819
		1.250	-22.478	12.447
		1.250		
	2	0.000		
		0.000	0.889	9.965
		0.113	0.000	10.015
		1.250	-8.905	4.955
		1.250		
	3	0.000		
		0.000	5.079	45.453
		0.137	0.000	45.801
		1.250	-41.221	22.864
		1.250		
	4	0.000		
		0.000	3.777	32.298
		0.142	0.000	32.567
		1.250	-29.390	16.290
		1.250		
29				
	1	0.000		
		0.000	-22.478	12.447
		1.250	-48.003	-31.604
		1.250		
	2	0.000		
		0.000	-8.905	4.955
		1.250	-18.698	-12.297
		1.250		
	3	0.000		
		0.000	41.221	22.864
		1.250	-87.521	57.600
		1.250		
	4	0.000		
		0.000	-29.390	16.290
		1.250	-62.557	-41.178
		1.250		

30				
	1	0.000		-10.701
		0.000	30.883	-19.273
		1.250	15.673	9.825
		1.250		-10.701
	2	0.000		-3.408
		0.000	7.970	-5.316
		1.250	4.053	2.198
		1.250		-3.408
	3	0.000		-18.295
		0.000	49.811	-31.633
		1.250	25.291	15.306
		1.250		18.295
	4	0.000		-13.452
		0.000	37.607	-23.692
		1.250	19.091	11.744
		1.250		-13.452
31				
	1	0.000		-10.701
		0.000	15.673	9.825
		1.250	0.463	19.909
		1.250		-10.701
	2	0.000		-3.408
		0.000	4.053	2.198
		1.250	0.135	4.815
		1.250		-3.408
	3	0.000		-18.295
		0.000	25.291	15.306
		1.250	0.771	31.595
		1.250		-18.295
	4	0.000		-13.452
		0.000	19.091	11.744
		1.250	0.574	24.034
		1.250		-13.452
32				
	1	0.000		-10.701
		0.000	0.463	19.909
		0.038	0.000	19.918
		1.250	-14.747	10.981
		1.250		-10.701
	2	0.000		-3.408
		0.000	0.135	4.815
		0.043	0.000	4.818
		1.250	-3.782	2.535
		1.250		-3.408
	3	0.000		18.295
		0.000	0.771	31.595
		0.039	0.000	31.610
		1.250	23.749	17.234
		1.250		18.295
	4	0.000		-13.452
		0.000	0.574	24.034
		0.039	0.000	24.045
		1.250	-17.943	13.178
		1.250		-13.452
33				
	1	0.000		-10.701
		0.000	-14.747	10.981
		1.250	-29.957	-16.959
		1.250		-10.701
	2	0.000		-3.408
		0.000	-3.782	2.535
		1.250	-7.700	-4.641
		1.250		-3.408
	3	0.000		-18.295
		0.000	-23.749	17.234
		1.250	-48.269	-27.777
		1.250		-18.295
	4	0.000		13.452
		0.000	-17.943	13.178
		1.250	-36.460	-20.824
		1.250		-13.452

Lampiran 5. Input analisis S1-2 dengan SAP 90

```
Struktur 1-2

SYSTEM
L=2

JOINTS
1   x=0      y=0     z=0       : bidang koordinat X-Y
2   x=0      y=3
5   x=3.75   y=3           g=2,5,1
6   x=5      y=0
8   x=5      y=6           g=6,8,1
9   x=6.25   y=3
10  x=6.25   y=6
11  x=7.5    y=3
12  x=7.5    y=6
13  x=8.75   y=3
14  x=8.75   y=6
15  x=10     y=0
18  x=10     y=9           g=15,18,1
19  x=11.25  y=3
21  x=11.25  y=9           g=19,21,1
22  x=12.5   y=3
24  x=12.5   y=9           g=22,24,1
25  x=13.75  y=3
27  x=13.75  y=9           g=25,27,1
28  x=15     y=0
31  x=15     y=9           g=28,31,1

RESTRAINTS
1,31,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
6       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
15      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
28      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y

FRAME
NM=12   NL=4      Y=-1,0
C PROPERTIES POTONGAN
1  A=0.021532   I=0.000236224267 E=2.35E7        : MATERIAL BALOK
2  A=0.023946   I=0.000284063454
3  A=0.034316   I=0.000476004021
4  A=0.043490   I=0.000623894680
5  A=0.030658   I=0.000395217892
6  A=0.047869   I=0.000700936102
7  A=0.032403   I=0.000428197211
8  A=0.037055   I=0.000494897519
9  A=0.038955   I=0.000536642088
10 A=0.027124   I=0.000324643682
11 A=0.026470   I=0.000322867736
12 A=0.042229   I=0.000259964842 W=2.16 E=2.35E7: MATERIAL KOLOM
C BEBAN MATI
1  WG=0,-20.42,0
2  WG=0,-12.168,0
C BEBAN HIDUP
3  WG=0,-7.835,0
4  WG=0,-3.134,0
```

```
C KOLOM
1,1,2     M=12 G=1,1,5,5   LP=1,0
3,15,16   M=12
4,28,29   M=12 G=1,3,1,1
5,7,8     M=12 G=1,1,9,9
8,17,18   M=12 G=1,1,13,13
C BALOK
10,2,3    M=1              NSL=2,4
11,3,4    M=2  G=1,1,1,1   NSL=2,4
13,5,7    M=3              NSL=2,4
14,7,9    M=4              NSL=1,3
15,9,11   M=5  G=1,1,2,2   NSL=1,3
17,13,16  M=6              NSL=1,3
18,16,19  M=6  G=1,8,1,1   NSL=1,3
19,19,22  M=7  G=1,1,3,3   NSL=1,3
21,25,29  M=8  G=1,8,1,1   NSL=1,3
22,8,10   M=2  G=2,1,2,2   NSL=2,4
25,14,17  M-9              NSL=2,4
27,20,23  M=7  G=1,1,3,3   NSL=1,3
30,18,21  M=10 G=1,3,9,10  NSL=2,4
31,21,24  M=11 G=1,1,3,3   NSL=2,4

COMBO
1 C=1
2 C=0,1
3 C=1.2,1.6
4 C=1.05,0.65
```

PROGRAM:SAP90/FILE:s1-2.F3F
Struktur 1-2
F R A M E E L E M E N T F O R C E S

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE
1					
	1	0.000			-32.266
		0.000	-6.481	6.140	
		3.000	-6.481	-13.303	
		3.000			-25.786
	2	0.000			-6.347
		0.000	-1.533	1.482	
		3.000	-1.533	-2.116	
		3.000			-6.347
	3	0.000			-48.875
		0.000	-10.230	9.739	
		3.000	-10.230	-20.950	
		3.000			41.099
	4	0.000			-38.005
		0.000	-7.801	7.410	
		3.000	-7.801	-15.994	
		3.000			-31.201
2					
	1	0.000			-124.661
		0.000	0.180	-0.446	
		3.000	0.180	0.092	
		3.000			-118.181
	2	0.000			-34.810
		0.000	-0.794	0.761	
		3.000	-0.794	-1.622	
		3.000			-34.810
	3	0.000			-205.289
		0.000	-1.055	0.682	
		3.000	-1.055	-2.484	
		3.000			-197.513
	4	0.000			-153.520
		0.000	-0.328	0.026	
		3.000	-0.328	-0.957	
		3.000			-146.716
3					
	1	0.000			-247.948
		0.000	-0.467	0.189	
		3.000	-0.467	-1.213	
		3.000			-241.468
	2	0.000			-79.825
		0.000	-0.073	0.039	
		3.000	-0.073	-0.180	
		3.000			-79.825
	3	0.000			-425.258
		0.000	-0.678	0.289	
		3.000	-0.678	-1.744	
		3.000			-417.482
	4	0.000			-312.232
		0.000	0.538	0.224	
		3.000	0.538	-1.351	
		3.000			-305.428
4					
	1	0.000			142.264
		0.000	6.769	7.928	
		3.000	6.769	13.229	
		3.000			-135.784
	2	0.000			-43.553
		0.000	2.400	-2.449	
		3.000	2.400	4.752	
		3.000			-43.553
	3	0.000			-240.402
		0.000	11.963	-12.411	
		3.000	11.963	23.477	
		3.000			-232.626
	4	0.000			-177.687
		0.000	8.667	-9.023	
		3.000	8.667	16.979	
		3.000			-170.883

5				
1	0.000			-32.699
	0.000	-7.766	8.563	
	3.000	-7.766	-14.734	
	3.000			-26.219
2	0.000			-6.528
	0.000	-2.458	3.546	
	3.000	-2.458	-3.828	
	3.000			-6.528
3	0.000			-49.683
	0.000	-13.252	15.950	
	3.000	-13.252	-23.806	
	3.000			-41.907
4	0.000			-38.577
	0.000	-9.752	11.297	
	3.000	-9.752	-17.959	
	3.000			-31.773
6				
1	0.000			-133.897
	0.000	-2.827	4.394	
	3.000	-2.827	-4.089	
	3.000			-127.417
2	0.000			-37.980
	0.000	-1.796	2.194	
	3.000	-1.796	-3.195	
	3.000			-37.980
3	0.000			-221.444
	0.000	-6.267	8.782	
	3.000	-6.267	-10.018	
	3.000			-213.668
4	0.000			-165.279
	0.000	-4.136	6.039	
	3.000	-4.136	-6.370	
	3.000			-158.475
7				
1	0.000			-89.585
	0.000	10.593	-16.177	
	3.000	10.593	15.603	
	3.000			-83.105
2	0.000			-26.007
	0.000	4.254	-6.230	
	3.000	4.254	6.433	
	3.000			-26.007
3	0.000			-149.113
	0.000	19.519	-29.461	
	3.000	19.519	29.096	
	3.000			-141.337
4	0.000			-110.968
	0.000	13.888	-21.068	
	3.000	13.888	20.597	
	3.000			-104.164
8				
1	0.000			-37.237
	0.000	-11.182	13.426	
	3.000	-11.182	-20.121	
	3.000			-30.757
2	0.000			-7.927
	0.000	-3.524	5.102	
	1.000	1.524	5.471	
	3.000			-7.927
3	0.000			-57.367
	0.000	-19.058	24.275	
	3.000	-19.058	-32.898	
	3.000			-49.591
4	0.000			-44.251
	0.000	-14.032	17.414	
	3.000	-14.032	-24.683	
	3.000			-37.447
9				
1	0.000			-36.563
	0.000	11.182	-15.109	
	3.000	11.182	18.438	
	3.000			-30.083

2	0.000			-7.743
	0.000	3.524	-5.562	
	3.000	3.524	5.011	
	3.000			-7.743
3	0.000			-56.265
	0.000	19.058	-27.030	
	3.000	19.058	30.143	
	3.000			-48.489
4	0.000			-43.425
	0.000	14.032	-19.480	
	3.000	14.032	22.617	
	3.000			-36.621

10 ----------

1	0.000			-6.481
	0.000	25.786	-13.303	
	1.250	10.576	9.423	
	1.250			-6.481
2	0.000			-1.533
	0.000	6.347	-3.116	
	1.250	2.430	2.369	
	1.250			-1.533
3	0.000			-10.230
	0.000	41.099	20.950	
	1.250	16.579	15.099	
	1.250			-10.230
4	0.000			-7.801
	0.000	31.201	-15.994	
	1.250	12.684	11.435	
	1.250			-7.801

11 ----------

1	0.000			-6.481
	0.000	10.576	9.423	
	0.869	0.000	14.020	
	1.250	-4.634	13.138	
	1.250			-6.481
2	0.000			-1.533
	0.000	2.430	2.369	
	0.775	0.000	3.311	
	1.250	-1.488	2.957	
	1.250			1.533
3	0.000			-10.230
	0.000	16.579	15.099	
	0.845	0.000	22.105	
	1.250	-7.941	20.497	
	1.250			-10.230
4	0.000			-7.801
	0.000	12.684	11.435	
	0.856	0.000	16.865	
	1.250	-5.832	15.717	
	1.250			7.801

12 ----------

1	0.000			-6.481
	0.000	-4.634	13.138	
	1.250	-19.844	-2.160	
	1.250			6.481
2	0.000			-1.533
	0.000	-1.488	2.957	
	1.250	-5.405	-1.351	
	1.250			1.533
3	0.000			10.230
	0.000	-7.941	20.497	
	1.250	-32.461	-4.754	
	1.250			-10.230
4	0.000			-7.801
	0.000	5.832	15.717	
	1.250	24.349	1.147	
	1.250			7.801

13 ----------

1	0.000			6.481
	0.000	19.844	2.160	
	1.250	35.054	16.471	
	1.250			6.481
2	0.000			-1.533
	0.000	-5.405	-1.351	

	1.250	-9.323	-10.556	
	1.250			-1.533
3	0.000			-10.230
	0.000	-32.461	-4.754	
	1.250	-56.981	-60.655	
	1.250			-10.230
4	0.000			-7.801
	0.000	-24.349	-3.147	
	1.250	42.866	45.156	
	1.250			-7.801

14 ----------

1	0.000			1.464
	0.000	50.429	-44.942	
	1.250	24.904	2.140	
	1.250			1.464
2	0.000			0.131
	0.000	18.959	-15.724	
	1.250	9.165	1.854	
	1.250			0.131
3	0.000			1.967
	0.000	90.849	-79.089	
	1.250	44.549	5.535	
	1.250			1.967
4	0.000			1.623
	0.000	65.273	-57.410	
	1.250	32.106	3.452	
	1.250			1.623

15 ----------

1	0.000			1.464
	0.000	24.904	2.140	
	1.220	0.000	17.326	
	1.250	-0.621	17.317	
	1.250			1.464
2	0.000			0.131
	0.000	9.165	1.854	
	1.170	0.000	7.215	
	1.250	-0.628	7.189	
	1.250			0.131
3	0.000			1.967
	0.000	44.549	5.535	
	1.203	0.000	32.325	
	1.250	-1.751	32.283	
	1.250			1.967
4	0.000			1.623
	0.000	32.106	3.452	
	1.210	0.000	22.877	
	1.250	-1.061	22.856	
	1.250			1.623

16 ----------

1	0.000			1.464
	0.000	-0.621	17.317	
	1.250	-26.146	0.587	
	1.250			1.464
2	0.000			0.131
	0.000	-0.628	7.189	
	1.250	-10.422	0.283	
	1.250			0.131
3	0.000			1.967
	0.000	-1.751	32.283	
	1.250	-48.051	1.157	
	1.250			1.967
4	0.000			1.623
	0.000	-1.061	22.856	
	1.250	-34.228	0.800	
	1.250			1.623

17 ----------

1	0.000			1.464
	0.000	-26.146	0.587	
	1.250	-51.671	-48.049	
	1.250			1.464
2	0.000			0.131
	0.000	-10.422	0.283	
	1.250	-20.216	18.866	
	1.250			0.131

	3	0.000		1.967
		0.000	-48.051	1.157
		1.250	-94.351	-87.845
		1.250		1.967
	4	0.000		1.623
		0.000	-34.228	0.800
		1.250	-67.395	-62.715
		1.250		1.623
18				
	1	0.000		3.825
		0.000	55.900	-53.657
		1.250	30.375	0.266
		1.250		3.825
	2	0.000		1.854
		0.000	21.629	-21.240
		1.250	11.835	-0.325
		1.250		1.854
	3	0.000		7.556
		0.000	101.687	-98.372
		1.250	55.387	-0.201
		1.250		7.556
	4	0.000		5.221
		0.000	72.754	-70.145
		1.250	39.587	0.068
		1.250		5.221
19				
	1	0.000		3.825
		0.000	30.375	0.266
		1.250	4.850	22.281
		1.250		3.825
	2	0.000		1.854
		0.000	11.835	-0.325
		1.250	2.042	8.349
		1.250		1.854
	3	0.000		7.556
		0.000	55.387	-0.201
		1.250	9.087	40.095
		1.250		7.556
	4	0.000		5.221
		0.000	39.587	0.068
		1.250	6.420	28.822
		1.250		5.221
20				
	1	0.000		3.825
		0.000	4.850	22.281
		0.238	0.000	22.857
		1.250	-20.675	12.391
		1.250		3.825
	2	0.000		1.854
		0.000	2.042	8.349
		0.261	0.000	8.615
		1.250	-7.752	4.779
		1.250		1.854
	3	0.000		7.556
		0.000	9.087	40.095
		0.245	0.000	41.210
		1.250	-37.213	22.516
		1.250		7.556
	4	0.000		5.221
		0.000	6.420	28.822
		0.242	0.000	29.599
		1.250	-26.748	16.117
		1.250		5.221
21				
	1	0.000		3.825
		0.000	-20.675	12.391
		1.250	-46.200	-29.406
		1.250		3.825
	2	0.000		1.854
		0.000	-7.752	4.779
		1.250	-17.546	11.032
		1.250		1.854
	3	0.000		7.556
		0.000	-37.213	22.516

	1.250	-83.513	-52.938	
	1.250			7.556
4	0.000			5.221
	0.000	-26.748	16.117	
	1.250	-59.915	-38.047	
	1.250			5.221
22				
1	0.000			-7.766
	0.000	26.219	-14.734	
	1.250	11.009	8.533	
	1.250			7.766
2	0.000			2.458
	0.000	6.528	-3.828	
	1.250	2.610	1.883	
	1.250			-2.458
3	0.000			-13.252
	0.000	41.907	-23.806	
	1.250	17.387	13.253	
	1.250			-13.252
4	0.000			-9.752
	0.000	31.773	17.959	
	1.250	13.256	10.184	
	1.250			-9.752
23				
1	0.000			-7.766
	0.000	11.009	8.533	
	0.905	0.000	13.513	
	1.250	-4.201	12.787	
	1.250			-7.766
2	0.000			-2.458
	0.000	2.610	1.883	
	0.833	0.000	2.970	
	1.250	-1.307	2.698	
	1.250			-2.458
3	0.000			-13.252
	0.000	17.387	13.253	
	0.886	0.000	20.958	
	1.250	-7.133	19.661	
	1.250			-13.252
4	0.000			-9.752
	0.000	13.256	10.184	
	0.895	0.000	16.114	
	1.250	-5.261	15.180	
	1.250			-9.752
24				
1	0.000			-7.766
	0.000	4.201	12.787	
	1.250	19.411	1.971	
	1.250			7.766
2	0.000			2.458
	0.000	1.307	2.698	
	1.250	-5.225	1.385	
	1.250			-2.458
3	0.000			-13.252
	0.000	-7.133	19.661	
	1.250	-31.653	-4.581	
	1.250			-13.252
4	0.000			9.752
	0.000	-5.261	15.180	
	1.250	-23.778	-2.969	
	1.250			-9.752
25				
1	0.000			-7.766
	0.000	-19.411	-1.971	
	1.250	-34.621	-35.741	
	1.250			-7.766
2	0.000			-2.458
	0.000	-5.225	1.385	
	1.250	-9.142	-10.364	
	1.250			-2.458
3	0.000			-13.252
	0.000	-31.653	-4.581	
	1.250	-56.173	-59.472	
	1.250			-13.252

	4	0.000		-9.752
		0.000	-23.778	-2.969
		1.250	-42.295	-44.265
		1.250		-9.752
26				
	1	0.000		0.589
		0.000	55.559	-53.256
		1.250	30.034	0.239
		1.250		0.589
	2	0.000		-0.730
		0.000	20.911	-18.661
		1.250	11.117	1.356
		1.250		-0.730
	3	0.000		-0.461
		0.000	100.128	-93.766
		1.250	53.828	2.457
		1.250		-0.461
	4	0.000		0.144
		0.000	71.929	-68.049
		1.250	38.762	1.132
		1.250		0.144
27				
	1	0.000		0.589
		0.000	30.034	0.239
		1.250	4.509	21.828
		1.250		0.589
	2	0.000		-0.730
		0.000	11.117	1.356
		1.250	1.323	9.131
		1.250		-0.730
	3	0.000		-0.461
		0.000	53.828	2.457
		1.250	7.528	40.804
		1.250		-0.461
	4	0.000		0.144
		0.000	38.762	1.132
		1.250	5.594	28.855
		1.250		0.144
28				
	1	0.000		0.589
		0.000	4.509	21.828
		0.221	0.000	22.326
		1.250	-21.016	11.511
		1.250		0.589
	2	0.000		0.730
		0.000	1.323	9.131
		0.169	0.000	9.243
		1.250	8.470	4.665
		1.250		0.730
	3	0.000		0.461
		0.000	7.528	40.804
		0.203	0.000	41.569
		1.250	-38.772	21.277
		1.250		-0.461
	4	0.000		0.144
		0.000	5.594	28.855
		0.211	0.000	29.445
		1.250	-27.573	15.119
		1.250		0.144
29				
	1	0.000		0.589
		0.000	-21.016	11.511
		1.250	-46.541	-30.712
		1.250		0.589
	2	0.000		-0.730
		0.000	-8.470	4.665
		1.250	-18.264	-12.044
		1.250		-0.730
	3	0.000		-0.461
		0.000	-38.772	21.277
		1.250	-85.072	-56.126
		1.250		-0.461
	4	0.000		0.144
		0.000	-27.573	15.119

	1.250	-60.740	-40.077	
	1.250			0.144
30				
1	0.000			-11.182
	0.000	30.757	-20.121	
	1.250	15.547	8.819	
	1.250			-11.182
2	0.000			-3.524
	0.000	7.927	-5.471	
	1.250	4.009	1.989	
	1.250			3.524
3	0.000			-19.058
	0.000	49.591	-32.898	
	1.250	25.071	13.766	
	1.250			-19.058
4	0.000			-14.032
	0.000	37.447	-24.683	
	1.250	18.930	10.553	
	1.250			-14.032
31				
1	0.000			-11.182
	0.000	15.547	8.819	
	1.250	0.337	18.746	
	1.250			11.182
2	0.000			-3.524
	0.000	4.009	1.989	
	1.250	0.092	4.553	
	1.250			-3.524
3	0.000			-19.058
	0.000	25.071	13.766	
	1.250	0.551	29.779	
	1.250			-19.058
4	0.000			-14.032
	0.000	18.930	10.553	
	1.250	0.413	22.642	
	1.250			-14.032
32				
1	0.000			-11.182
	0.000	0.337	18.746	
	0.028	0.000	18.750	
	1.250	-14.873	9.660	
	1.250			11.182
2	0.000			-3.524
	0.000	0.092	4.553	
	0.029	0.000	4.554	
	1.250	-3.826	2.219	
	1.250			3.524
3	0.000			-19.058
	0.000	0.551	29.779	
	0.028	0.000	29.787	
	1.250	-23.969	15.143	
	1.250			-19.058
4	0.000			-14.032
	0.000	0.413	22.642	
	0.028	0.000	22.648	
	1.250	-18.104	11.586	
	1.250			-14.032
33				
1	0.000			11.182
	0.000	-14.873	9.660	
	1.250	30.083	18.438	
	1.250			-11.182
2	0.000			-3.524
	0.000	-3.826	2.219	
	1.250	-7.743	-5.011	
	1.250			-3.524
3	0.000			-19.058
	0.000	-23.969	15.143	
	1.250	-48.489	-30.143	
	1.250			-19.058
4	0.000			-14.032
	0.000	-18.104	11.586	
	1.250	-36.621	-22.617	
	1.250			-14.032

Lampiran 7. Input analisis S1-3 dengan SAP 90

```
Struktur 1-3

SYSTEM
L=2

JOINTS
1   x=0      y=0     z=0       : bidang koordinat X-Y
2   x=0      y=3
5   x=3.75   y=3            g=2,5,1
6   x=5      y=0
8   x=5      y=6            g=6,8,1
9   x=6.25   y=3
10  x=6.25   y=6
11  x=7.5    y=3
12  x=7.5    y=6
13  x=8.75   y=3
14  x=8.75   y=6
15  x=10     y=0
18  x=10     y=9            g=15,18,1
19  x=11.25  y=3
21  x=11.25  y=9            g=19,21,1
22  x=12.5   y=3
24  x=12.5   y=9            g=22,24,1
25  x=13.75  y=3
27  x=13.75  y=9            g=25,27,1
28  x=15     y=0
31  x=15     y=9            g=28,31,1

RESTRAINTS
1,31,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
6       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
15      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
28      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y

FRAME
NM=11   NL=4      Y=-1,0
C PROPERTIES POTONGAN
1  A=0.021532   I=0.000236224267 E=2.35E7        : MATERIAL BALOK
2  A=0.023946   I=0.000284063454
3  A=0.038953   I=0.000536448259
4  A=0.047400   I=0.000694801388
5  A=0.030658   I=0.000395217892
6  A=0.049671   I=0.000731653782
7  A=0.027124   I=0.000324643682
8  A=0.037055   I=0.000494897519
9  A=0.026470   I=0.000322867736
10 A=0.049206   I=0.000725060382
11 A=0.042229   I=0.000259964842 W=2.16 E=2.35E7: MATERIAL KOLOM
C BEBAN MATI
1  WG=0,-20.42,0
2  WG=0,-12.168,0
C BEBAN HIDUP
3  WG=0,-7.835,0
4  WG=0,-3.134,0
C KOLOM
```

```
1,1,2     M=11 G=1,1,5,5   LP=1,0
3,15,16   M=11
4,28,29   M=11 G=1,3,1,1
5,7,8     M=11 G=1,1,9,9
8,17,18   M=11 G=1,1,13,13
C BALOK
10,2,3    M=1              NSL=2,4
11,3,4    M=1  G=1,1,1,1   NSL=2,4
13,5,7    M=3  G=1,12,9,10 NSL=2,4
14,7,9    M=4              NSL=1,3
15,9,11   M=9  G=1,1,2,2   NSL=1,3
17,13,16  M=10             NSL=1,3
18,16,19  M=6  G=1,8,1,1   NSL=1,3
19,19,22  M=5  G=1,1,3,3   NSL=1,3
21,25,29  M=8  G=1,8,1,1   NSL=1,3
22,8,10   M-2              NSL=2,4
23,10,12  M=1  G=1,1,2,2   NSL=2,4
27,20,23  M=5  G=1,1,3,3   NSL=1,3
30,18,21  M=7  G=1,3,9,10  NSL=2,4
31,21,24  M=9  G=1,1,3,3   NSL=2,4

COMBO
1 C=1
2 C=0,1
3 C=1.2,1.6
4 C=1.05,0.65
```

PROGRAM:SAP90/FILE:s1-3.F3F
Struktur 1-3

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

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE
1					
	1	0.000			-31.865
		0.000	-6.621	6.281	
		3.000	-6.621	-13.583	
		3.000			-25.385
	2	0.000			-6.226
		0.000	-1.548	1.498	
		3.000	-1.548	-3.145	
		3.000			-6.226
	3	0.000			-48.199
		0.000	-10.422	9.934	
		3.000	-10.422	-21.331	
		3.000			-40.423
	4	0.000			-37.505
		0.000	-7.958	7.569	
		3.000	-7.958	-16.306	
		3.000			-30.701
2					
	1	0.000			-124.816
		0.000	0.210	-0.471	
		3.000	0.210	0.160	
		3.000			-118.336
	2	0.000			-34.829
		0.000	-0.837	0.806	
		3.000	-0.837	-1.705	
		3.000			-34.829
	3	0.000			-205.506
		0.000	-1.087	0.724	
		3.000	-1.087	-2.536	
		3.000			-197.730
	4	0.000			-153.696
		0.000	-0.323	0.029	
		3.000	-0.323	-0.940	
		3.000			-146.892
3					
	1	0.000			-248.839
		0.000	-0.410	0.136	
		3.000	-0.410	-1.093	
		3.000			-242.359
	2	0.000			-80.148
		0.000	-0.025	-0.007	
		3.000	-0.025	-0.083	
		3.000			-80.148
	3	0.000			-426.844
		0.000	-0.532	0.151	
		3.000	-0.532	-1.444	
		3.000			-419.068
	4	0.000			-313.378
		0.000	-0.446	0.138	
		3.000	-0.446	-1.202	
		3.000			-306.574
4					
	1	0.000			-141.620
		0.000	6.821	-7.126	
		3.000	6.821	13.336	
		3.000			-135.140
	2	0.000			-43.332
		0.000	2.410	-2.457	
		3.000	2.410	4.772	
		3.000			-43.332
	3	0.000			-239.274
		0.000	12.040	-12.483	
		3.000	12.040	21.608	
		3.000			-231.498
	4	0.000			-176.866
		0.000	8.728	-9.079	
		3.000	8.728	17.104	

	3.000			-170.062
5	----------			
1	0.000			-32.385
	0.000	-7.946	8.716	
	3.000	-7.946	-15.121	
	3.000			-25.905
2	0.000			-6.442
	0.000	-2.513	3.644	
	3.000	-2.513	-3.895	
	3.000			-6.442
3	0.000			-49.169
	0.000	-13.556	16.290	
	3.000	-13.556	-24.378	
	3.000			-41.393
4	0.000			-38.191
	0.000	-9.977	11.520	
	3.000	-9.977	-18.409	
	3.000			-31.387
6	----------			
1	0.000			-134.545
	0.000	-2.733	4.255	
	3.000	-2.733	-3.944	
	3.000			-128.065
2	0.000			-38.154
	0.000	-1.783	2.135	
	3.000	-1.783	-3.215	
	3.000			-38.154
3	0.000			-222.501
	0.000	-6.133	8.522	
	3.000	-6.133	-9.876	
	3.000			-214.725
4	0.000			-166.073
	0.000	-4.029	5.855	
	3.000	-4.029	-6.231	
	3.000			-159.269
7	----------			
1	0.000			-89.250
	0.000	10.679	-16.297	
	3.000	10.679	15.739	
	3.000			-82.770
2	0.000			-25.919
	0.000	4.296	-6.327	
	3.000	4.296	6.561	
	3.000			-25.919
3	0.000			-148.571
	0.000	19.689	-29.680	
	3.000	19.689	29.385	
	3.000			-140.795
4	0.000			-110.560
	0.000	14.005	-21.225	
	3.000	14.005	20.791	
	3.000			102.756
8	----------			
1	0.000			-37.248
	0.000	-11.183	13.401	
	3.000	-11.183	-20.149	
	3.000			-30.768
2	0.000			-7.928
	0.000	-3.547	5.157	
	3.000	-3.547	-5.483	
	3.000			-7.928
3	0.000			-57.382
	0.000	-19.095	24.333	
	3.000	-19.095	-32.952	
	3.000			-49.606
4	0.000			-44.263
	0.000	-14.048	17.424	
	3.000	-14.048	-24.720	
	3.000			-37.459
9	----------			
1	0.000			-36.552
	0.000	11.183	-15.140	
	3.000	11.183	18.411	
	3.000			-30.072

2	0.000			-7.742
	0.000	3.547	-5.622	
	3.000	3.547	5.018	
	3.000			-7.742
3	0.000			-56.250
	0.000	19.095	-27.163	
	3.000	19.095	30.122	
	3.000			-48.474
4	0.000			-43.412
	0.000	14.048	-19.551	
	3.000	14.048	22.593	
	3.000			-36.608

10 ----------

1	0.000			-6.621
	0.000	25.385	-13.583	
	1.250	10.175	8.641	
	1.250			-6.621
2	0.000			-1.548
	0.000	6.226	-3.145	
	1.250	2.308	2.189	
	1.250			-1.548
3	0.000			-10.422
	0.000	40.423	-21.331	
	1.250	15.903	13.873	
	1.250			-10.422
4	0.000			-7.958
	0.000	30.701	-16.306	
	1.250	12.184	10.497	
	1.250			-7.958

11 ----------

1	0.000			-6.621
	0.000	10.175	8.641	
	0.836	0.000	12.895	
	1.250	-5.035	11.854	
	1.250			-6.621
2	0.000			-1.548
	0.000	2.308	2.189	
	0.737	0.000	3.040	
	1.250	-1.609	2.626	
	1.250			-1.548
3	0.000			-10.422
	0.000	15.903	13.873	
	0.811	0.000	20.319	
	1.250	-8.617	18.427	
	1.250			-10.422
4	0.000			-7.958
	0.000	12.184	10.497	
	0.822	0.000	15.507	
	1.250	-6.333	14.154	
	1.250			-7.958

12 ----------

1	0.000			-6.621
	0.000	-5.035	11.854	
	1.250	-20.245	-3.947	
	1.250			6.621
2	0.000			1.548
	0.000	1.609	2.626	
	1.250	-5.527	-1.833	
	1.250			-1.548
3	0.000			-10.422
	0.000	-8.617	18.427	
	1.250	-33.137	-7.669	
	1.250			-10.422
4	0.000			7.958
	0.000	-6.333	14.154	
	1.250	-24.850	-5.336	
	1.250			-7.958

13 ----------

1	0.000			6.621
	0.000	-20.245	-3.947	
	1.250	-35.455	-38.760	
	1.250			-6.621
2	0.000			-1.548

		0.000	-5.527	-1.833	
		1.250	-9.444	-11.190	
		1.250			-1.548
	3	0.000			-10.422
		0.000	-33.137	-7.669	
		1.250	-57.657	-64.415	
		1.250			10.422
	4	0.000			-7.958
		0.000	-24.850	-5.336	
		1.250	-43.367	-47.971	
		1.250			-7.958
14					
	1	0.000			1.535
		0.000	50.496	-47.316	
		1.250	24.971	-0.149	
		1.250			1.535
	2	0.000			0.129
		0.000	18.944	-16.538	
		1.250	9.150	1.020	
		1.250			0.129
	3	0.000			2.047
		0.000	90.905	-83.241	
		1.250	44.605	1.453	
		1.250			2.047
	4	0.000			1.695
		0.000	65.334	-60.432	
		1.250	32.167	0.506	
		1.250			1.695
15					
	1	0.000			1.535
		0.000	24.971	-0.149	
		1.223	0.000	15.119	
		1.250	-0.554	15.112	
		1.250			1.535
	2	0.000			0.129
		0.000	9.150	1.020	
		1.168	0.000	6.363	
		1.250	-0.644	6.336	
		1.250			0.129
	3	0.000			2.047
		0.000	44.605	1.453	
		1.204	0.000	28.311	
		1.250	-1.695	28.272	
		1.250			2.047
	4	0.000			1.695
		0.000	32.167	0.506	
		1.212	0.000	20.005	
		1.250	-1.000	19.986	
		1.250			1.695
16					
	1	0.000			1.535
		0.000	-0.554	15.112	
		1.250	-26.079	-1.534	
		1.250			1.535
	2	0.000			0.129
		0.000	-0.644	6.336	
		1.250	-10.438	-0.590	
		1.250			0.129
	3	0.000			2.047
		0.000	-1.695	28.272	
		1.250	-47.995	-2.784	
		1.250			2.047
	4	0.000			1.695
		0.000	-1.000	19.986	
		1.250	-34.167	-1.994	
		1.250			1.695
17					
	1	0.000			1.535
		0.000	-26.079	-1.534	
		1.250	-51.604	-50.085	
		1.250			1.535
	2	0.000			0.129
		0.000	-10.438	-0.590	
		1.250	-20.231	-19.758	

	1.250			0.129
3	0.000			2.047
	0.000	-47.995	-2.784	
	1.250	-94.295	-91.715	
	1.250			2.047
4	0.000			1.695
	0.000	-34.167	-1.994	
	1.250	-67.334	-65.432	
	1.250			1.695
18				
1	0.000			3.858
	0.000	56.210	-55.434	
	1.250	30.685	-1.124	
	1.250			3.858
2	0.000			1.887
	0.000	21.763	-21.976	
	1.250	11.969	-0.893	
	1.250			1.887
3	0.000			7.648
	0.000	102.273	-101.682	
	1.250	55.973	-2.778	
	1.250			7.648
4	0.000			5.277
	0.000	73.166	-72.490	
	1.250	39.999	-1.761	
	1.250			5.277
19				
1	0.000			3.858
	0.000	30.685	-1.124	
	1.250	5.160	21.279	
	1.250			3.858
2	0.000			1.887
	0.000	11.969	-0.893	
	1.250	2.175	7.947	
	1.250			1.887
3	0.000			7.648
	0.000	55.973	-2.778	
	1.250	9.673	38.250	
	1.250			7.648
4	0.000			5.277
	0.000	39.999	1.761	
	1.250	6.832	27.509	
	1.250			5.277
20				
1	0.000			3.858
	0.000	5.160	21.279	
	0.253	0.000	21.931	
	1.250	-20.365	11.776	
	1.250			3.858
2	0.000			1.887
	0.000	2.175	7.947	
	0.273	0.000	8.249	
	1.250	-7.618	4.545	
	1.250			1.887
3	0.000			7.648
	0.000	9.673	38.250	
	0.261	0.000	39.513	
	1.250	-36.627	21.404	
	1.250			7.648
4	0.000			5.277
	0.000	6.832	27.509	
	0.257	0.000	28.388	
	1.250	-26.335	15.319	
	1.250			5.277
21				
1	0.000			3.858
	0.000	-20.365	11.776	
	1.250	-45.890	-29.633	
	1.250			3.858
2	0.000			1.887
	0.000	-7.618	4.545	
	1.250	-17.412	-11.099	
	1.250			1.887

3	0.000			7.648
	0.000	-36.627	21.404	
	1.250	-82.927	-53.318	
	1.250			7.648
4	0.000			5.277
	0.000	-26.335	15.319	
	1.250	-59.502	-38.329	
	1.250			5.277

22 ----------

1	0.000			-7.946
	0.000	25.905	-15.121	
	1.250	10.695	7.754	
	1.250			-7.946
2	0.000			-2.513
	0.000	6.442	-3.895	
	1.250	2.524	1.709	
	1.250			-2.513
3	0.000			-13.556
	0.000	41.393	-24.378	
	1.250	16.873	12.038	
	1.250			-13.556
4	0.000			-9.977
	0.000	31.387	-18.409	
	1.250	12.870	9.252	
	1.250			-9.977

23 ----------

1	0.000			-7.946
	0.000	10.695	7.754	
	0.879	0.000	12.454	
	1.250	-4.515	11.616	
	1.250			-7.946
2	0.000			-2.513
	0.000	2.524	1.709	
	0.805	0.000	2.725	
	1.250	-1.393	2.415	
	1.250			-2.513
3	0.000			-13.556
	0.000	16.873	12.038	
	0.860	0.000	19.294	
	1.250	-7.647	17.804	
	1.250			-13.556
4	0.000			-9.977
	0.000	12.870	9.252	
	0.869	0.000	14.843	
	1.250	-5.647	13.767	
	1.250			9.977

24 ----------

1	0.000			7.946
	0.000	4.515	11.616	
	1.250	19.725	3.534	
	1.250			7.946
2	0.000			2.513
	0.000	-1.393	2.415	
	1.250	-5.311	-1.775	
	1.250			2.513
3	0.000			-13.556
	0.000	-7.647	17.804	
	1.250	-32.167	-7.081	
	1.250			13.556
4	0.000			-9.977
	0.000	-5.647	13.767	
	1.250	-24.163	-4.864	
	1.250			-9.977

25 ----------

1	0.000			-7.946
	0.000	-19.725	-3.534	
	1.250	-34.935	-37.697	
	1.250			-7.946
2	0.000			-2.513
	0.000	5.311	1.775	
	1.250	-9.228	-10.862	
	1.250			-2.513
3	0.000			-13.556
	0.000	-32.167	-7.081	

		1.250	-56.687	-62.615	
		1.250			-13.556
	4	0.000			-9.977
		0.000	-24.163	-4.864	
		1.250	-42.680	-46.642	
		1.250			-9.977
26					
	1	0.000			0.504
		0.000	55.883	-55.042	
		1.250	30.358	-1.142	
		1.250			0.504
	2	0.000			-0.749
		0.000	20.998	-19.234	
		1.250	11.204	0.892	
		1.250			-0.749
	3	0.000			-0.594
		0.000	100.655	-96.825	
		1.250	54.355	0.057	
		1.250			-0.594
	4	0.000			0.043
		0.000	72.325	-70.296	
		1.250	39.158	-0.619	
		1.250			0.043
27					
	1	0.000			0.504
		0.000	30.358	-1.142	
		1.250	4.833	20.852	
		1.250			0.504
	2	0.000			-0.749
		0.000	11.204	0.892	
		1.250	1.410	8.776	
		1.250			-0.749
	3	0.000			-0.594
		0.000	54.355	0.057	
		1.250	8.055	39.064	
		1.250			-0.594
	4	0.000			0.043
		0.000	39.158	-0.619	
		1.250	5.991	27.599	
		1.250			0.043
28					
	1	0.000			0.504
		0.000	4.833	20.852	
		0.237	0.000	21.424	
		1.250	-20.692	10.939	
		1.250			0.504
	2	0.000			-0.749
		0.000	1.410	8.776	
		0.180	0.000	8.903	
		1.250	-8.384	4.417	
		1.250			-0.749
	3	0.000			0.594
		0.000	8.055	39.064	
		0.217	0.000	39.940	
		1.250	-38.245	20.195	
		1.250			-0.594
	4	0.000			0.043
		0.000	5.991	27.599	
		0.226	0.000	28.275	
		1.250	-27.176	14.358	
		1.250			0.043
29					
	1	0.000			0.504
		0.000	-20.692	10.939	
		1.250	-46.217	-30.879	
		1.250			0.504
	2	0.000			-0.749
		0.000	-8.384	4.417	
		1.250	-18.177	-12.183	
		1.250			0.749
	3	0.000			-0.594
		0.000	-38.245	20.195	
		1.250	-84.545	-56.548	
		1.250			-0.594

4	0.000			0.043
	0.000	-27.176	14.358	
	1.250	-60.344	-40.342	
	1.250			0.043

30 ----------

1	0.000			-11.183
	0.000	30.768	-20.149	
	1.250	15.558	8.804	
	1.250			-11.183
2	0.000			-3.547
	0.000	7.928	-5.483	
	1.250	4.010	1.978	
	1.250			-3.547
3	0.000			-19.095
	0.000	49.606	-32.952	
	1.250	25.086	13.731	
	1.250			-19.095
4	0.000			-14.048
	0.000	37.459	-24.720	
	1.250	18.942	10.531	
	1.250			-14.048

31 ----------

1	0.000			-11.183
	0.000	15.558	8.804	
	1.250	0.348	18.745	
	1.250			-11.183
2	0.000			-3.547
	0.000	4.010	1.978	
	1.250	0.093	4.543	
	1.250			-3.547
3	0.000			-19.095
	0.000	25.086	13.731	
	1.250	0.566	29.763	
	1.250			-19.095
4	0.000			-14.048
	0.000	18.942	10.531	
	1.250	0.425	22.636	
	1.250			-14.048

32 ----------

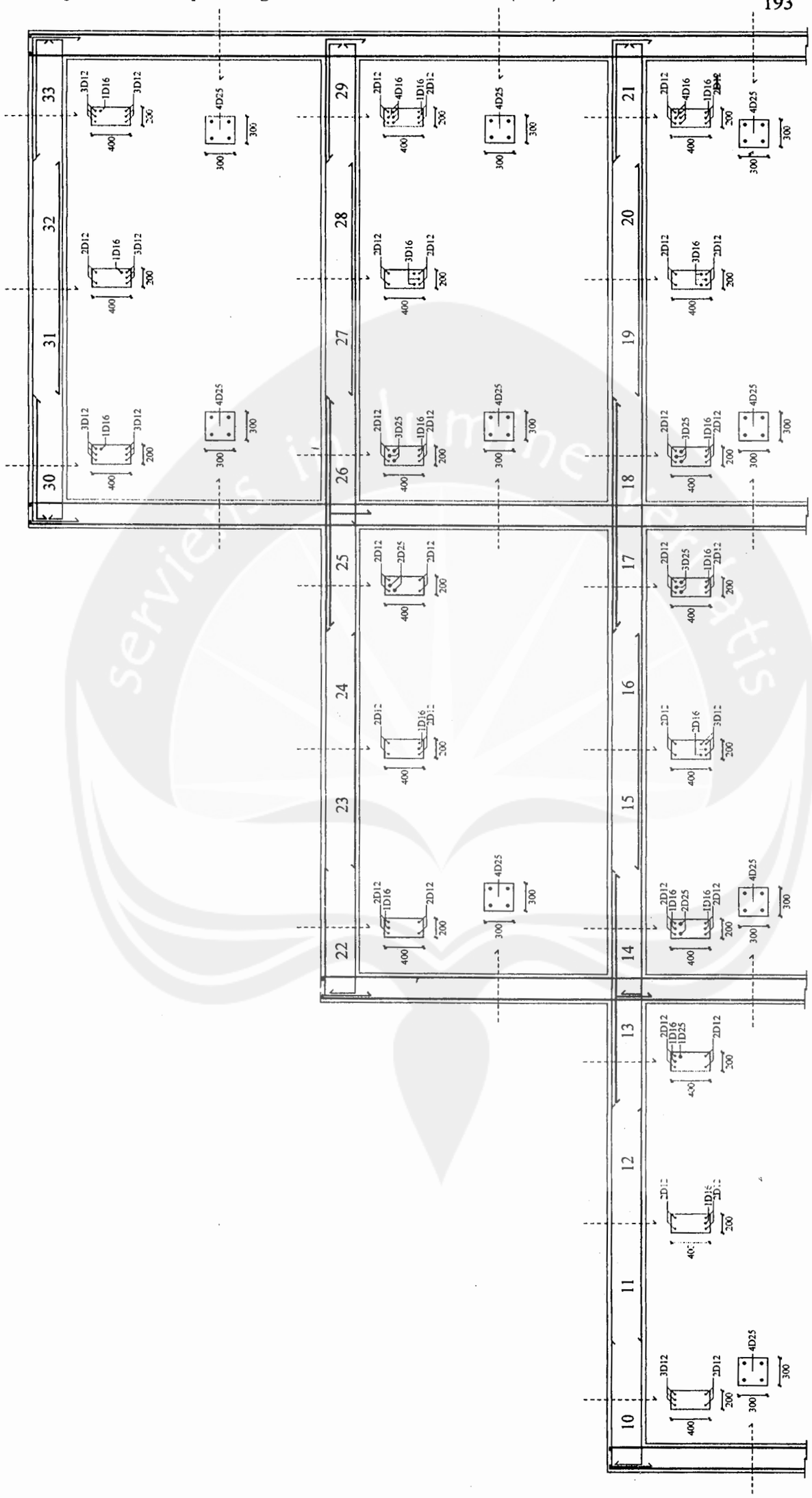
1	0.000			-11.183
	0.000	0.348	18.745	
	0.029	0.000	18.750	
	1.250	-14.862	9.674	
	1.250			-11.183
2	0.000			-3.547
	0.000	0.093	4.543	
	0.030	0.000	4.544	
	1.250	-3.825	2.211	
	1.250			-3.547
3	0.000			-19.095
	0.000	0.566	29.763	
	0.029	0.000	29.771	
	1.250	-23.954	15.146	
	1.250			-19.095
4	0.000			-14.048
	0.000	0.425	22.636	
	0.029	0.000	22.642	
	1.250	-18.091	11.594	
	1.250			-14.048

33 ----------

1	0.000			-11.183
	0.000	-14.862	9.674	
	1.250	-30.072	-18.411	
	1.250			-11.183
2	0.000			-3.547
	0.000	-3.825	2.211	
	1.250	-7.742	-5.018	
	1.250			-3.547
3	0.000			-19.095
	0.000	-23.954	15.146	
	1.250	-48.474	-30.122	
	1.250			-19.095
4	0.000			-14.048
	0.000	-18.091	11.594	

1.250	-36.608	-22.593	
1.250			-14.048

Serviens in lumine veritatis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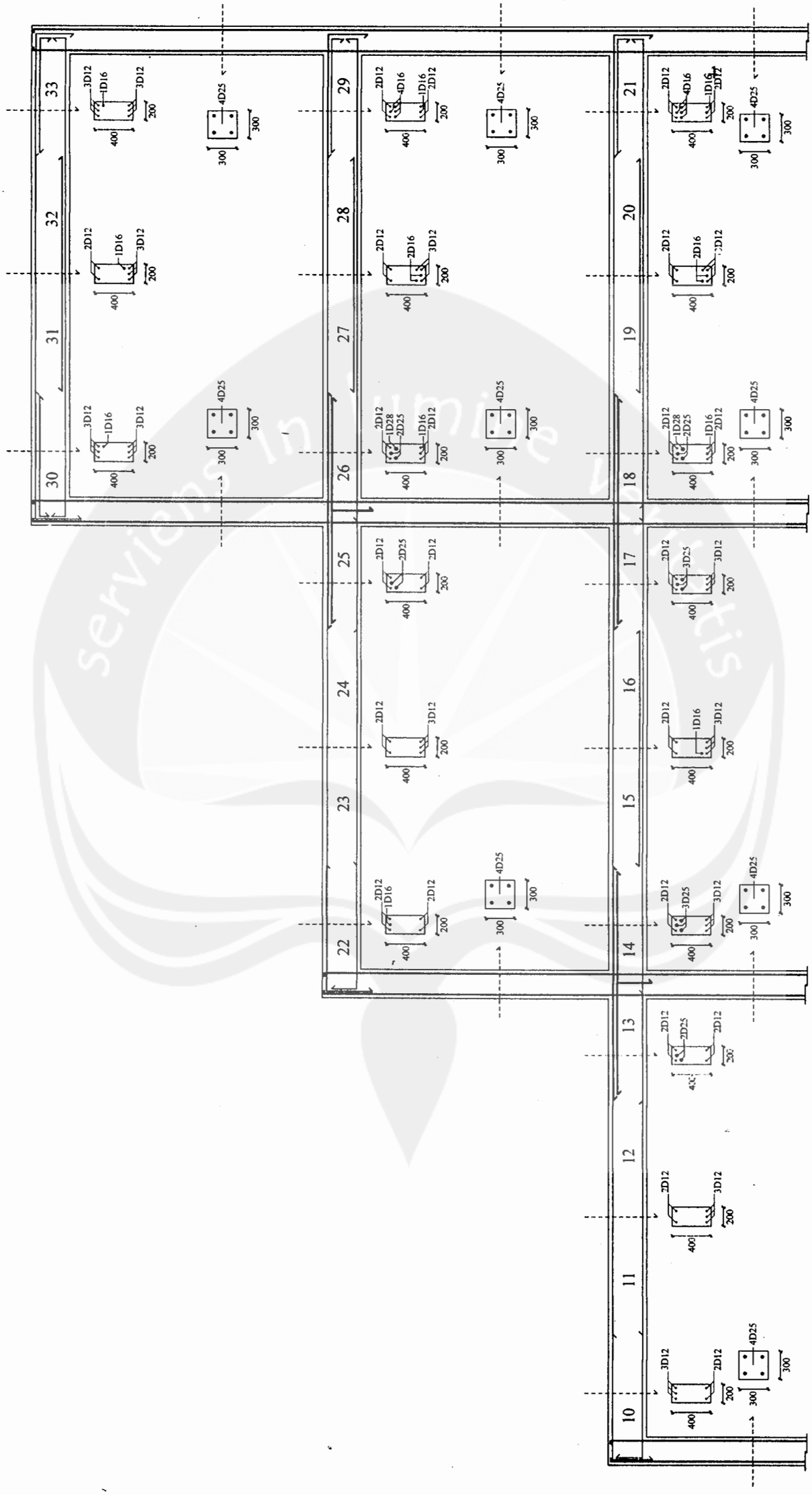
Skala 1:50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1D28
4D25
400
300
200

Skala 1:50

Lampiran 11. Input analisis S2-1 dengan SAP 90

```
Struktur 2-1

SYSTEM
L=2

JOINTS
1   x=0      y=0     z=0       : bidang koordinat X-Y
4   x=0      y=9           g=1,4,1
5   x=1.25   y=3
7   x=1.25   y=9           g=5,7,1
8   x=2.5    y=3
10  x=2.5    y=9           g=8,10,1
11  x=3.75   y=3
13  x=3.75   y=9           g=11,13,1
14  x=5      y=0
17  x=5      y=9           g=14,17,1
18  x=6.25   y=3
19  x=6.25   y=6
20  x=7.5    y=3
21  x=7.5    y=6
22  x=8.75   y=3
23  x=8.75   y=6
24  x=10     y=0
27  x=10     y=9           g=24,27,1
28  x=11.25  y=3
30  x=11.25  y=9           g=28,30,1
31  x=12.5   y=3
33  x=12.5   y=9           g=31,33,1
34  x=13.75  y=3
36  x=13.75  y=9           g=34,36,1
37  x=15     y=0
40  x=15     y=9           g=37,40,1

RESTRAINTS
1,40,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
14      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
24      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
37      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y

FRAME
NM=2   NL=4      Y=-1,0
C PROPERTIES POTONGAN
1  SH=P T=0.4,0.20  E=2.35E7 W=3.016        : MATERIAL KOLOM
2  SH=R T=0.4,0.30  E=2.35E7                : MATERIAL BALOK
C BEBAN MATI
1  WG=0,-21.029,0
2  WG=0,-12.801,0
C BEBAN HIDUP
3  WG=0,-7.585,0
4  WG=0,-3.034,0
```

```
C KOLOM
1,1,2        M=1  G=2,4,1,1  LP=1,0
2,14,15           G=2,4,1,1
3,24,25           G=2,4,1,1
4,37,38           G=2,4,1,1
C BALOK
13,2,5       M=2  G=2,1,3,3  NSL=1,3
16,11,15                     NSL=1,3
17,15,18                     NSL=1,3
18,18,20          G=1,1,2,2  NSL=1,3
20,22,25          G=3,1,3,3  NSL=1,3
24,34,38                     NSL=1,3
25,3,6            G=2,1,3,3  NSL=1,3
28,12,16                     NSL=1,3
29,16,19                     NSL=2,4
30,19,21          G=1,1,2,2  NSL=2,4
32,23,26                     NSL=2,4
33,26,29          G=2,1,3,3  NSL=1,3
36,35,39                     NSL=1,3
37,4,7            G=2,1,3,3  NSL=2,4
40,13,17                     NSL=2,4
41,27,30          G=2,1,3,3  NSL=2,4
44,36,40                     NSL=2,4

COMBO
1 C=1
2 C=0,1
3 C=1.2,1.6
4 C=1.05,0.65
```

PROGRAM:SAP90/FILE:s2-1.F3F
Struktur 2-1

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

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE
1					
	1	0.000			-159.199
		0.000	-7.055	6.905	
		3.000	-7.055	-14.259	
		3.000			-150.151
	2	0.000			-43.922
		0.000	-2.479	2.427	
		3.000	-2.479	-5.010	
		3.000			-43.922
	3	0.000			-261.314
		0.000	-12.432	12.169	
		3.000	-12.432	-25.128	
		3.000			-250.456
	4	0.000			-195.708
		0.000	-9.019	8.828	
		3.000	-9.019	-18.229	
		3.000			-186.208
2					
	1	0.000			-253.959
		0.000	0.441	-0.400	
		3.000	0.441	0.923	
		3.000			-244.911
	2	0.000			-73.645
		0.000	0.040	-0.032	
		3.000	0.040	0.087	
		3.000			-73.645
	3	0.000			-422.584
		0.000	0.593	-0.532	
		3.000	0.593	1.247	
		3.000			-411.726
	4	0.000			-314.527
		0.000	0.489	0.441	
		3.000	0.489	1.026	
		3.000			-305.026
3					
	1	0.000			-253.959
		0.000	-0.441	0.400	
		3.000	-0.441	-0.923	
		3.000			-244.911
	2	0.000			-73.645
		0.000	-0.040	0.032	
		3.000	-0.040	-0.087	
		3.000			-73.645
	3	0.000			-422.584
		0.000	-0.593	0.532	
		3.000	-0.593	-1.247	
		3.000			-411.726
	4	0.000			-314.527
		0.000	-0.489	0.441	
		3.000	-0.489	-1.026	
		3.000			-305.026
4					
	1	0.000			-159.199
		0.000	7.055	-6.905	
		3.000	7.055	14.259	
		3.000			-150.151
	2	0.000			-43.922
		0.000	2.479	-2.427	
		3.000	2.479	5.010	
		3.000			-43.922
	3	0.000			-261.314
		0.000	12.432	-12.169	
		3.000	12.432	25.128	
		3.000			-250.456
	4	0.000			-195.708
		0.000	9.019	-8.828	
		3.000	9.019	18.229	

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	3.000			-186.208
5	----------			
1	0.000			-100.307
	0.000	-12.988	19.719	
	3.000	-12.988	-19.244	
	3.000			-91.259
2	0.000			25.989
	0.000	-4.864	7.209	
	3.000	-4.864	-7.383	
	3.000			-25.989
3	0.000			-161.952
	0.000	-23.368	35.199	
	3.000	-23.368	-34.906	
	3.000			-151.094
4	0.000			-122.216
	0.000	-16.799	25.392	
	3.000	-16.799	-25.005	
	3.000			-112.715
6	----------			
1	0.000			-137.037
	0.000	1.944	-2.490	
	3.000	1.944	3.343	
	3.000			-127.989
2	0.000			-34.691
	0.000	1.408	-1.439	
	3.000	1.408	2.784	
	3.000			-34.691
3	0.000			-219.950
	0.000	4.586	-5.291	
	3.000	4.586	8.466	
	3.000			-209.092
4	0.000			-166.438
	0.000	2.957	-3.550	
	3.000	2.957	5.320	
	3.000			-156.938
7	----------			
1	0.000			-137.037
	0.000	-1.944	2.490	
	3.000	-1.944	-3.343	
	3.000			-127.989
2	0.000			-34.691
	0.000	-1.408	1.439	
	3.000	-1.408	2.784	
	3.000			34.691
3	0.000			-219.950
	0.000	4.586	5.291	
	3.000	4.586	8.466	
	3.000			209.092
4	0.000			-166.438
	0.000	2.957	3.550	
	3.000	-2.957	-5.320	
	3.000			-156.938
8	----------			
1	0.000			100.307
	0.000	12.988	19.719	
	3.000	12.988	19.244	
	3.000			-91.259
2	0.000			25.989
	0.000	4.864	-7.209	
	3.000	4.864	7.383	
	3.000			-25.989
3	0.000			-161.952
	0.000	23.368	-35.199	
	3.000	23.368	34.906	
	3.000			-151.094
4	0.000			-122.216
	0.000	16.799	-25.392	
	3.000	16.799	25.005	
	3.000			-112.715
9	----------			
1	0.000			-40.687
	0.000	-11.850	16.413	
	3.000	-11.850	-19.137	
	3.000			-31.639

	2	0.000		-7.499
		0.000	-3.491	5.651
		3.000	-3.491	-4.823
		3.000		-7.499
	3	0.000		-60.823
		0.000	-19.806	28.737
		3.000	-19.806	-30.681
		3.000		-49.965
	4	0.000		-47.596
		0.000	-14.712	20.907
		3.000	-14.712	-23.229
		3.000		-38.095
10				
	1	0.000		-41.414
		0.000	11.850	-14.595
		3.000	11.850	20.955
		3.000		-32.366
	2	0.000		-7.671
		0.000	3.491	5.221
		3.000	3.491	5.252
		3.000		-7.671
	3	0.000		-61.970
		0.000	19.806	-25.869
		3.000	19.806	33.550
		3.000		-51.113
	4	0.000		-48.471
		0.000	14.712	-18.719
		3.000	14.712	25.417
		3.000		-38.970
11				
	1	0.000		-41.414
		0.000	-11.850	14.595
		3.000	-11.850	-20.955
		3.000		-32.366
	2	0.000		-7.671
		0.000	-3.491	5.221
		3.000	-3.491	-5.252

		3.000		-7.671
	3	0.000		-61.970
		0.000	-19.806	25.869
		3.000	-19.806	-33.550
		3.000		-51.113
	4	0.000		-48.471
		0.000	-14.712	18.719
		3.000	14.712	25.417
		3.000		38.970
12				
	1	0.000		-40.687
		0.000	11.850	-16.413
		3.000	11.850	19.137
		3.000		31.639
	2	0.000		7.499
		0.000	3.491	5.651
		3.000	3.491	4.823
		3.000		7.499
	3	0.000		-60.823
		0.000	19.806	-28.737
		3.000	19.806	30.681
		3.000		-49.965
	4	0.000		-47.596
		0.000	14.712	-20.907
		3.000	14.712	23.229
		3.000		-38.095
13				
	1	0.000		5.933
		0.000	49.843	-33.979
		1.250	23.557	11.897
		1.250		5.933
	2	0.000		2.385
		0.000	17.933	-12.220
		1.250	8.451	4.270
		1.250		2.385
	3	0.000		10.936

	0.000	88.504	-60.326	
	1.250	41.791	21.108	
	1.250			10.936
4	0.000			7.780
	0.000	63.992	-43.621	
	1.250	30.228	15.267	
	1.250			7.780
14 ----------				
1	0.000			5.933
	0.000	23.557	11.897	
	1.120	0.000	25.091	
	1.250	-2.729	24.914	
	1.250			5.933
2	0.000			2.385
	0.000	8.451	4.270	
	1.114	0.000	8.979	
	1.250	-1.030	8.909	
	1.250			2.385
3	0.000			10.936
	0.000	41.791	21.108	
	1.118	0.000	44.475	
	1.250	-4.923	44.151	
	1.250			10.936
4	0.000			7.780
	0.000	30.228	15.267	
	1.119	0.000	32.182	
	1.250	-3.535	31.951	
	1.250			7.780
15 ----------				
1	0.000			5.933
	0.000	-2.729	24.914	
	1.250	-29.015	5.074	
	1.250			5.933
2	0.000			2.385
	0.000	-1.030	8.909	
	1.250	-10.511	1.696	
	1.250			2.385
3	0.000			10.936

	0.000	-4.923	44.151	
	1.250	-51.636	8.802	
	1.250			10.936
4	0.000			7.780
	0.000	-3.535	31.951	
	1.250	-37.298	6.430	
	1.250			7.780
16 ----------				
1	0.000			5.933
	0.000	-29.015	5.074	
	1.250	-55.302	-47.624	
	1.250			5.933
2	0.000			2.385
	0.000	-10.511	1.696	
	1.250	-19.992	-17.369	
	1.250			2.385
3	0.000			10.936
	0.000	-51.636	8.802	
	1.250	-98.350	-84.940	
	1.250			10.936
4	0.000			7.780
	0.000	-37.298	6.430	
	1.250	-71.062	-61.295	
	1.250			7.780
17 ----------				
1	0.000			4.430
	0.000	52.573	-44.210	
	1.250	26.286	5.076	
	1.250			4.430
2	0.000			1.017
	0.000	18.963	-15.843	
	1.250	9.481	1.934	
	1.250			1.017
3	0.000			6.943
	0.000	93.427	-78.402	
	1.250	46.714	9.186	
	1.250			6.943

	4	0.000		5.312
		0.000	67.527	-56.719
		1.250	33.763	6.587
		1.250		5.312
18				
	1	0.000		4.430
		0.000	26.286	5.076
		1.250	0.000	21.505
		1.250		4.430
	2	0.000		1.017
		0.000	9.481	1.934
		1.250	0.000	7.860
		1.250		1.017
	3	0.000		6.943
		0.000	46.713	9.186
		1.250	0.000	38.382
		1.250		6.943
	4	0.000		5.312
		0.000	33.763	6.587
		1.250	0.000	27.689
		1.250		5.312
19				
	1	0.000		4.430
		0.000	0.000	21.505
		1.250	-26.286	5.076
		1.250		4.430
	2	0.000		1.017
		0.000	0.000	7.860
		1.250	-9.481	1.934
		1.250		1.017
	3	0.000		6.943
		0.000	0.000	38.382
		1.250	-46.713	9.186
		1.250		6.943
	4	0.000		5.312
		0.000	0.000	27.689
		1.250	-33.763	6.587
		1.250		5.312
20				
	1	0.000		4.430
		0.000	-26.286	5.076
		1.250	-52.572	-44.210
		1.250		4.430
	2	0.000		1.017
		0.000	-9.481	1.934
		1.250	-18.962	-15.843
		1.250		1.017
	3	0.000		6.943
		0.000	46.713	9.186
		1.250	93.427	78.402
		1.250		6.943
	4	0.000		5.312
		0.000	-33.763	6.587
		1.250	-67.527	-56.719
		1.250		5.312
21				
	1	0.000		5.933
		0.000	55.302	-47.624
		1.250	29.015	5.074
		1.250		5.933
	2	0.000		2.385
		0.000	19.992	-17.369
		1.250	10.511	1.696
		1.250		2.385
	3	0.000		10.936
		0.000	98.350	-84.940
		1.250	51.636	8.802
		1.250		10.936
	4	0.000		7.780
		0.000	71.062	-61.295
		1.250	37.298	6.430
		1.250		7.780
22				
	1	0.000		5.933

		0.000	29.015	5.074
		1.250	2.729	24.914
		1.250		5.933
	2	0.000		2.385
		0.000	10.511	1.696
		1.250	1.030	8.909
		1.250		2.385
	3	0.000		10.936
		0.000	54.636	8.802
		1.250	4.923	44.154
		1.250		10.936
	4	0.000		7.780
		0.000	37.298	6.430
		1.250	3.535	31.951
		1.250		7.780
23				
	1	0.000		5.933
		0.000	2.729	24.914
		0.130	0.000	25.091
		1.250	-23.557	11.897
		1.250		5.933
	2	0.000		2.385
		0.000	1.030	8.909
		0.136	0.000	8.979
		1.250	-8.451	4.270
		1.250		2.385
	3	0.000		10.936
		0.000	4.923	44.154
		0.132	0.000	44.475
		1.250	-41.791	21.108
		1.250		10.936
	4	0.000		7.780
		0.000	3.535	31.951
		0.131	0.000	32.182
		1.250	-30.228	15.267
		1.250		7.780
24				

	1	0.000		5.933
		0.000	-23.557	11.897
		1.250	-49.843	-33.979
		1.250		5.933
	2	0.000		2.385
		0.000	-8.451	4.270
		1.250	-17.933	-12.220
		1.250		2.385
	3	0.000		10.936
		0.000	-41.791	21.108
		1.250	-88.504	-60.326
		1.250		10.936
	4	0.000		7.780
		0.000	-30.228	15.267
		1.250	-63.992	-43.621
		1.250		7.780
25				
	1	0.000		1.138
		0.000	50.572	45.657
		1.250	24.286	11.129
		1.250		-1.138
	2	0.000		-1.373
		0.000	18.490	-13.034
		1.250	9.009	4.153
		1.250		-1.373
	3	0.000		-3.562
		0.000	90.271	63.643
		1.250	43.558	23.001
		1.250		3.562
	4	0.000		-2.087
		0.000	65.120	-45.912
		1.250	31.356	14.386
		1.250		2.087
26				
	1	0.000		-1.138
		0.000	24.286	11.129
		1.155	0.000	25.153

	1.250	-2.000	25.058	
	1.250			-1.138
2	0.000			-1.373
	0.000	9.009	4.153	
	1.188	0.000	9.503	
	1.250	-0.472	9.489	
	1.250			-1.373
3	0.000			-3.562
	0.000	43.558	20.001	
	1.166	0.000	45.385	
	1.250	-3.156	45.252	
	1.250			-3.562
4	0.000			-2.087
	0.000	31.356	14.386	
	1.161	0.000	32.586	
	1.250	-2.407	32.479	
	1.250			-2.087
27				
1	0.000			-1.138
	0.000	-2.000	25.058	
	1.250	-28.286	6.129	
	1.250			-1.138
2	0.000			-1.373
	0.000	-0.472	9.489	
	1.250	-9.954	2.973	
	1.250			-1.373
3	0.000			-3.562
	0.000	-3.156	45.252	
	1.250	-49.869	12.111	
	1.250			-3.562
4	0.000			-2.087
	0.000	-2.407	32.479	
	1.250	-36.171	8.368	
	1.250			-2.087
28				
1	0.000			-1.138
	0.000	-28.286	6.129	
	1.250	-54.573	-45.658	
	1.250			-1.138
2	0.000			-1.373
	0.000	-9.954	2.973	
	1.250	-19.435	-15.395	
	1.250			-1.373
3	0.000			-3.562
	0.000	-49.869	12.111	
	1.250	96.583	79.422	
	1.250			-3.562
4	0.000			-2.087
	0.000	-36.171	8.368	
	1.250	-69.934	-57.948	
	1.250			-2.087
29				
1	0.000			-11.043
	0.000	32.003	-27.720	
	1.250	16.001	2.283	
	1.250			-11.043
2	0.000			-3.456
	0.000	7.585	7.390	
	1.250	3.792	-0.279	
	1.250			-3.456
3	0.000			-18.782
	0.000	50.539	-45.087	
	1.250	25.270	2.293	
	1.250			18.782
4	0.000			-13.842
	0.000	38.533	-33.909	
	1.250	19.266	2.215	
	1.250			-13.842
30				
1	0.000			-11.043
	0.000	16.001	2.283	
	1.250	0.000	12.283	
	1.250			-11.043

2	0.000			-3.456
	0.000	3.793	-0.279	
	1.250	0.000	2.092	
	1.250			-3.456
3	0.000			-10.782
	0.000	25.270	2.293	
	1.250	0.000	18.087	
	1.250			18.782
4	0.000			-13.842
	0.000	19.266	2.215	
	1.250	0.000	14.257	
	1.250			-13.842

31 ----------

1	0.000			-11.043
	0.000	0.000	12.283	
	1.250	-16.001	2.283	
	1.250			11.043
2	0.000			-3.456
	0.000	0.000	2.092	
	1.250	-3.792	-0.279	
	1.250			-3.456
3	0.000			-18.782
	0.000	0.000	18.087	
	1.250	-25.269	2.293	
	1.250			-18.782
4	0.000			-13.842
	0.000	0.000	14.257	
	1.250	-19.266	2.215	
	1.250			-13.842

32 ----------

1	0.000			-11.043
	0.000	-16.001	2.283	
	1.250	-32.002	-27.720	
	1.250			11.043
2	0.000			-3.456
	0.000	-3.792	-0.279	
	1.250	-7.585	-7.390	
	1.250			-3.456
3	0.000			-18.782
	0.000	-25.269	2.293	
	1.250	-50.539	-45.087	
	1.250			18.782
4	0.000			13.842
	0.000	19.266	2.215	
	1.250	38.533	-33.909	
	1.250			-13.842

33 ----------

1	0.000			-1.138
	0.000	54.573	-45.658	
	1.250	28.286	6.129	
	1.250			1.138
2	0.000			1.373
	0.000	9.415	15.395	
	1.250	9.954	2.973	
	1.250			1.373
3	0.000			-3.562
	0.000	96.583	-79.422	
	1.250	49.869	12.111	
	1.250			-3.562
4	0.000			-2.087
	0.000	69.934	-57.948	
	1.250	36.171	8.368	
	1.250			-2.087

34 ----------

1	0.000			-1.138
	0.000	28.286	6.129	
	1.250	2.000	25.058	
	1.250			-1.138
2	0.000			-1.373
	0.000	9.954	2.973	
	1.250	0.472	9.489	
	1.250			1.373
3	0.000			3.562

	0.000	49.869	12.111	
	1.250	3.156	45.252	
	1.250			-3.562
4	0.000			-2.087
	0.000	36.171	8.368	
	1.250	2.407	32.479	
	1.250			-2.087

35 ----------

1	0.000			-1.138
	0.000	2.000	25.058	
	0.095	0.000	25.153	
	1.250	-24.286	11.129	
	1.250			1.138
2	0.000			-1.373
	0.000	0.472	9.489	
	0.062	0.000	9.503	
	1.250	-9.009	4.153	
	1.250			-1.373
3	0.000			-3.562
	0.000	3.156	45.252	
	0.084	0.000	45.385	
	1.250	-43.558	20.001	
	1.250			-3.562
4	0.000			-2.087
	0.000	2.407	32.479	
	0.089	0.000	32.586	
	1.250	-31.356	14.386	
	1.250			-2.087

36 ----------

1	0.000			-1.138
	0.000	-24.286	11.129	
	1.250	-50.572	-35.657	
	1.250			-1.138
2	0.000			-1.373
	0.000	-9.009	4.153	
	1.250	-18.490	-13.034	
	1.250			-1.373
3	0.000			-3.562
	0.000	-43.558	20.001	
	1.250	-90.271	-63.643	
	1.250			-3.562
4	0.000			-2.087
	0.000	-31.356	14.386	
	1.250	-65.120	-45.912	
	1.250			2.087

37 ----------

1	0.000			-11.850
	0.000	31.639	-19.137	
	1.250	15.638	10.411	
	1.250			11.850
2	0.000			-3.491
	0.000	7.499	-4.823	
	1.250	3.707	2.181	
	1.250			3.491
3	0.000			-19.806
	0.000	49.965	-30.681	
	1.250	24.696	15.982	
	1.250			-19.806
4	0.000			-14.712
	0.000	38.095	-23.229	
	1.250	18.829	12.349	
	1.250			-14.712

38 ----------

1	0.000			-11.850
	0.000	15.638	10.411	
	1.222	0.000	19.962	
	1.250	-0.364	19.957	
	1.250			-11.850
2	0.000			-3.491
	0.000	3.707	2.181	
	1.222	0.000	4.445	
	1.250	-0.086	4.444	
	1.250			-3.491
3	0.000			-19.806

		0.000	24.696	15.982
		1.222	0.000	31.066
		1.250	-0.574	31.058
		1.250		-19.806
	4	0.000		-14.712
		0.000	18.829	12.349
		1.222	0.000	23.850
		1.250	-0.438	23.843
		1.250		-14.712
39	----------			
	1	0.000		-11.850
		0.000	-0.364	19.957
		1.250	-16.365	9.502
		1.250		-11.850
	2	0.000		-3.491
		0.000	-0.086	4.444
		1.250	-3.878	1.966
		1.250		-3.491
	3	0.000		-19.806
		0.000	-0.574	31.058
		1.250	-25.843	14.548
		1.250		-19.806
	4	0.000		-14.712
		0.000	-0.438	23.843
		1.250	-19.704	11.255
		1.250		-14.712
40	----------			
	1	0.000		-11.850
		0.000	-16.365	9.502
		1.250	-32.366	-20.955
		1.250		-11.850
	2	0.000		-3.491
		0.000	-3.878	1.966
		1.250	-7.671	-5.252
		1.250		-3.491
	3	0.000		-19.806
		0.000	-25.843	14.548
		1.250	-51.113	-33.550
		1.250		-19.806
	4	0.000		-14.712
		0.000	-19.704	11.255
		1.250	-38.970	-25.417
		1.250		-14.712
41	----------			
	1	0.000		-11.850
		0.000	32.366	-20.955
		1.250	16.365	9.502
		1.250		-11.850
	2	0.000		-3.491
		0.000	7.671	5.252
		1.250	3.878	1.966
		1.250		-3.491
	3	0.000		-19.806
		0.000	51.113	-33.550
		1.250	25.843	14.548
		1.250		-19.806
	4	0.000		-14.712
		0.000	38.970	25.417
		1.250	19.704	11.255
		1.250		-14.712
42	----------			
	1	0.000		-11.850
		0.000	16.365	9.502
		1.250	0.364	19.957
		1.250		-11.850
	2	0.000		-3.491
		0.000	3.878	1.966
		1.250	0.086	4.444
		1.250		-3.491
	3	0.000		-19.806
		0.000	25.843	14.548
		1.250	0.574	31.058
		1.250		-19.806

	4	0.000		-14.712
		0.000	19.704	11.255
		1.250	0.438	23.843
		1.250		-14.712
43				
	1	0.000		-11.850
		0.000	0.364	19.957
		0.028	0.000	19.962
		1.250	-15.638	10.411
		1.250		-11.850
	2	0.000		-3.491
		0.000	0.086	4.444
		0.028	0.000	4.445
		1.250	-3.707	2.181
		1.250		-3.491
	3	0.000		-19.806
		0.000	0.574	31.058
		0.028	0.000	31.066
		1.250	-24.696	15.982
		1.250		-19.806
	4	0.000		-14.712
		0.000	0.438	23.843
		0.028	0.000	23.850
		1.250	-18.829	12.349
		1.250		-14.712
44				
	1	0.000		-11.850
		0.000	-15.638	10.411
		1.250	-31.639	-19.137
		1.250		-11.850
	2	0.000		-3.491
		0.000	-3.707	2.181
		1.250	-7.499	-4.823
		1.250		-3.491
	3	0.000		-19.806
		0.000	-24.696	15.982
		1.250	-49.965	-30.681
		1.250		-19.806
	4	0.000		-14.712
		0.000	-18.829	12.349
		1.250	-38.095	-23.229
		1.250		-14.712

servitus in lumine veritatis

Lampiran 13. Input analisis S2-2 dengan SAP 90

```
Struktur 2-2

SYSTEM
L=2

JOINTS
1   x=0      y=0     z=0       : bidang koordinat X-Y
4   x=0      y=9           g=1,4,1
5   x=1.25   y=3
7   x=1.25   y=9           g=5,7,1
8   x=2.5    y=3
10  x=2.5    y=9           g=8,10,1
11  x=3.75   y=3
13  x=3.75   y=9           g=11,13,1
14  x=5      y=0
17  x=5      y=9           g=14,17,1
18  x=6.25   y=3
19  x=6.25   y=6
20  x=7.5    y=3
21  x=7.5    y=6
22  x=8.75   y=3
23  x=8.75   y=6
24  x=10     y=0
27  x=10     y=9           g=24,27,1
28  x=11.25  y=3
30  x=11.25  y=9           g=28,30,1
31  x=12.5   y=3
33  x=12.5   y=9           g=31,33,1
34  x=13.75  y=3
36  x=13.75  y=9           g=34,36,1
37  x=15     y=0
40  x=15     y=9           g=37,40,1

RESTRAINTS
1,40,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
14      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
24      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
37      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y

FRAME
NM=10   NL=4      Y=-1,0
C PROPERTIES POTONGAN
1  A=0.047446  I=0.000654851536  E=2.35E7          : MATERIAL BALOK
2  A=0.037842  I=0.000476910322
3  A=0.058321  I=0.000876466860
4  A=0.051461  I=0.000738305413
5  A=0.034903  I=0.000417296577
6  A=0.026151  I=0.000251437242
7  A=0.033181  I=0.000371151274
8  A=0.032483  I=0.000370280080
9  A=0.039979  I=0.000519477781
10 A=0.059527  I=0.000806961500  E=2.35E7 W=3.016 : MATERIAL KOLOM
C BEBAN MATI
1  WG=0,-21.029,0
2  WG=0,-12.801,0
```

```
C BEBAN HIDUP
3  WG=0,-7.585,0
4  WG=0,-3.034,0
C KOLOM
1,1,2       M=10 G=2,4,1,1  LP=1,0
2,14,15     M=10 G=1,1,10,10
4,37,38     M=10 G=2,4,1,1
6,15,16     M=10 G=1,4,1,1
7,25,26     M=10 G=1,4,1,1
C BALOK
13,2,5      M=1  G=1,11,32,33  NSL=1,3
14,5,8      M=2  G=1,1,3,3     NSL=1,3
16,11,15    M=3  G=1,5,14,13   NSL=1,3
17,15,18    M=3  G=1,3,7,7     NSL=1,3
18,18,20    M=5  G=1,1,2,2     NSL=1,3
22,28,31    M=2  G=1,1,3,3     NSL=1,3
25,3,6      M=1  G=1,11,32,33  NSL=1,3
26,6,9      M=2  G=1,1,3,3     NSL=1,3
28,12,16    M=4  G=1,5,14,13   NSL=1,3
29,16,19    M=9  G=1,3,7,7     NSL=2,4
30,19,21    M=6  G=1,1,2,2     NSL=2,4
34,29,32    M=2  G=1,1,3,3     NSL=1,3
37,4,7      M=7  G=1,3,9,10    NSL=2,4
38,7,10     M=8  G=1,1,3,3     NSL=2,4
41,27,30    M=7  G=1,3,9,10    NSL=2,4
42,30,33    M=8  G=1,1,3,3     NSL=2,4

COMBO
1 C=1
2 C=0,1
3 C=1.2,1.6
4 C=1.05,0.65
```

PROGRAM:SAP90/FILE:s2-2B.F3F
Struktur 2-2

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

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE
1					
	1	0.000			-158.737
		0.000	-8.145	8.325	
		3.000	-8.145	-16.111	
		3.000			-149.689
	2	0.000			-43.765
		0.000	-2.837	2.899	
		3.000	-2.837	-5.611	
		3.000			-43.765
	3	0.000			-260.508
		0.000	-14.313	14.628	
		3.000	-14.313	-28.312	
		3.000			-249.650
	4	0.000			-195.121
		0.000	-10.397	10.625	
		3.000	-10.397	-20.564	
		3.000			-185.620
2					
	1	0.000			-254.421
		0.000	0.571	-0.520	
		3.000	0.571	1.192	
		3.000			-245.373
	2	0.000			-73.803
		0.000	-0.012	0.020	
		3.000	-0.012	-0.015	
		3.000			-73.803
	3	0.000			-423.390
		0.000	0.666	-0.591	
		3.000	0.666	1.407	
		3.000			-412.532
	4	0.000			-315.114
		0.000	0.592	-0.533	
		3.000	0.592	1.243	
		3.000			-305.614
3					
	1	0.000			-254.421
		0.000	-0.571	0.520	
		3.000	-0.571	-1.192	
		3.000			-245.373
	2	0.000			-73.803
		0.000	0.012	-0.020	
		3.000	0.012	0.015	
		3.000			-73.803
	3	0.000			-423.390
		0.000	-0.666	0.591	
		3.000	-0.666	-1.407	
		3.000			-412.532
	4	0.000			-315.114
		0.000	-0.592	0.533	
		3.000	-0.592	-1.243	
		3.000			-305.614
4					
	1	0.000			-158.737
		0.000	8.145	-8.325	
		3.000	8.145	16.111	
		3.000			-149.689
	2	0.000			-43.765
		0.000	2.837	-2.899	
		3.000	2.837	5.611	
		3.000			-43.765
	3	0.000			-260.508
		0.000	14.313	-14.628	
		3.000	14.313	28.312	
		3.000			-249.650
	4	0.000			-195.121
		0.000	10.397	-10.625	
		3.000	10.397	20.564	

	3.000			-185.620
5	----------			
1	0.000			-100.309
	0.000	-14.458	21.875	
	3.000	-14.458	-21.498	
	3.000			-91.261
2	0.000			-26.018
	0.000	-5.439	8.009	
	3.000	-5.439	-8.309	
	3.000			-26.018
3	0.000			-161.999
	0.000	-26.052	39.063	
	3.000	-26.052	-39.092	
	3.000			-151.141
4	0.000			-122.236
	0.000	-18.716	28.174	
	3.000	-18.716	-27.974	
	3.000			-112.735
6	----------			
1	0.000			-137.036
	0.000	1.931	-2.832	
	3.000	1.931	2.961	
	3.000			-127.988
2	0.000			-34.662
	0.000	1.737	-1.805	
	3.000	1.737	3.408	
	3.000			-34.662
3	0.000			-219.903
	0.000	5.097	-6.285	
	3.000	5.097	9.005	
	3.000			-209.045
4	0.000			-166.418
	0.000	3.157	-4.146	
	3.000	3.157	5.324	
	3.000			-156.918
7	----------			
1	0.000			-137.036
	0.000	-1.931	2.832	
	3.000	-1.931	-2.961	
	3.000			-127.988
2	0.000			-34.662
	0.000	-1.737	1.805	
	3.000	-1.737	-3.408	
	3.000			-34.662
3	0.000			-219.903
	0.000	-5.097	6.285	
	3.000	-5.097	-9.005	
	3.000			-209.045
4	0.000			-166.418
	0.000	-3.157	4.146	
	3.000	-3.157	-5.324	
	3.000			-156.918
8	----------			
1	0.000			-100.309
	0.000	14.458	-21.875	
	3.000	14.458	21.498	
	3.000			-91.261
2	0.000			-26.018
	0.000	5.439	-8.009	
	3.000	5.439	8.309	
	3.000			-26.018
3	0.000			-161.999
	0.000	26.052	-39.063	
	3.000	26.052	39.092	
	3.000			-151.141
4	0.000			-122.236
	0.000	18.716	-28.174	
	3.000	18.716	27.974	
	3.000			-112.735
9	----------			
1	0.000			-40.729
	0.000	-13.900	18.627	
	3.000	-13.900	-23.074	
	3.000			-31.681

2	0.000			-7.524
	0.000	-4.047	6.471	
	3.000	-4.047	-5.670	
	3.000			-7.524
3	0.000			-60.912
	0.000	-23.155	32.705	
	3.000	-23.155	-36.760	
	3.000			-50.055
4	0.000			-47.655
	0.000	-17.226	23.764	
	3.000	-17.226	-27.913	
	3.000			-38.155

10 ----------

1	0.000			-41.372
	0.000	13.900	-17.017	
	3.000	13.900	24.684	
	3.000			-32.324
2	0.000			-7.646
	0.000	4.047	-6.164	
	3.000	4.047	5.976	
	3.000			-7.646
3	0.000			-61.881
	0.000	23.155	-30.283	
	3.000	23.155	39.183	
	3.000			-51.023
4	0.000			-48.411
	0.000	17.226	-21.874	
	3.000	17.226	29.803	
	3.000			-38.911

11 ----------

1	0.000			-41.372
	0.000	-13.900	17.017	
	3.000	-13.900	-24.684	
	3.000			-32.324
2	0.000			-7.646
	0.000	-4.047	6.164	
	3.000	-4.047	-5.976	
	3.000			-7.646
3	0.000			-61.881
	0.000	-23.155	30.283	
	3.000	-23.155	-39.183	
	3.000			-51.023
4	0.000			-48.411
	0.000	-17.226	21.874	
	3.000	-17.226	-29.803	
	3.000			-38.911

12 ----------

1	0.000			-40.729
	0.000	13.900	-18.627	
	3.000	13.900	23.074	
	3.000			-31.681
2	0.000			-7.524
	0.000	4.047	-6.471	
	3.000	4.047	5.670	
	3.000			-7.524
3	0.000			-60.912
	0.000	23.155	-32.705	
	3.000	23.155	36.760	
	3.000			-50.055
4	0.000			-47.655
	0.000	17.226	-23.764	
	3.000	17.226	27.913	
	3.000			-38.155

13 ----------

1	0.000			6.312
	0.000	49.380	-37.986	
	1.250	23.094	7.310	
	1.250			6.312
2	0.000			2.603
	0.000	17.747	-13.620	
	1.250	8.266	2.638	
	1.250			2.603
3	0.000			11.738

		0.000	87.651	-67.375
		1.250	40.938	12.993
		1.250		
	4	0.000		
		0.000	63.385	-48.738
		1.250	29.621	9.390
		1.250		
14	----------			
	1	0.000		
		0.000	23.094	7.310
		1.098	0.000	19.991
		1.250	-3.192	19.749
		1.250		
	2	0.000		
		0.000	8.266	2.638
		1.090	0.000	7.142
		1.250	-1.216	7.044
		1.250		
	3	0.000		
		0.000	40.938	12.993
		1.095	0.000	35.416
		1.250	-5.776	34.969
		1.250		
	4	0.000		
		0.000	29.621	9.390
		1.097	0.000	25.633
		1.250	-4.142	25.315
		1.250		
15	----------			
	1	0.000		
		0.000	-3.192	19.749
		1.250	-29.479	-0.671
		1.250		
	2	0.000		
		0.000	-1.216	7.044
		1.250	-10.697	-0.401
		1.250		
	3	0.000		
		0.000	-5.776	34.969
		1.250	-52.489	-1.446
		1.250		
	4	0.000		
		0.000	-4.142	25.315
		1.250	-37.905	-0.965
		1.250		
16	----------			
	1	0.000		
		0.000	-29.479	-0.671
		1.250	-55.765	-53.948
		1.250		
	2	0.000		
		0.000	-10.697	-0.401
		1.250	-20.178	-19.697
		1.250		
	3	0.000		
		0.000	-52.489	-1.446
		1.250	-99.203	-96.254
		1.250		
	4	0.000		
		0.000	-37.905	-0.965
		1.250	-71.669	-69.449
		1.250		
17	----------			
	1	0.000		
		0.000	52.572	-49.924
		1.250	26.286	-0.637
		1.250		
	2	0.000		
		0.000	18.962	-17.908
		1.250	9.481	-0.130
		1.250		
	3	0.000		
		0.000	93.427	-88.561
		1.250	46.713	-0.973

	1.250			7.308
4	0.000			5.754
	0.000	67.527	-64.060	
	1.250	33.763	-0.754	
	1.250			5.754
18				
1	0.000			4.952
	0.000	26.286	-0.637	
	1.250	0.000	15.792	
	1.250			4.952
2	0.000			0.853
	0.000	9.481	-0.130	
	1.250	0.000	5.795	
	1.250			0.853
3	0.000			7.308
	0.000	46.713	-0.973	
	1.250	0.000	28.223	
	1.250			7.308
4	0.000			5.754
	0.000	33.763	-0.754	
	1.250	0.000	20.348	
	1.250			5.754
19				
1	0.000			4.952
	0.000	0.000	15.792	
	1.250	-26.286	-0.637	
	1.250			4.952
2	0.000			0.853
	0.000	0.000	5.795	
	1.250	-9.481	-0.130	
	1.250			0.853
3	0.000			7.308
	0.000	0.000	28.223	
	1.250	-46.714	-0.973	
	1.250			7.308
4	0.000			5.754
	0.000	0.000	20.348	
	1.250	-33.763	-0.754	
	1.250			5.754
20				
1	0.000			4.952
	0.000	-26.286	-0.637	
	1.250	-52.572	-49.924	
	1.250			4.952
2	0.000			0.853
	0.000	-9.481	-0.130	
	1.250	-18.962	-17.908	
	1.250			0.853
3	0.000			7.308
	0.000	-46.713	-0.973	
	1.250	-93.427	-88.561	
	1.250			7.308
4	0.000			5.754
	0.000	-33.763	-0.754	
	1.250	-67.527	-64.060	
	1.250			5.754
21				
1	0.000			6.312
	0.000	55.765	-53.948	
	1.250	29.479	-0.671	
	1.250			6.312
2	0.000			2.603
	0.000	20.178	-19.697	
	1.250	10.697	-0.401	
	1.250			2.603
3	0.000			11.738
	0.000	99.203	-96.254	
	1.250	52.489	-1.446	
	1.250			11.738
4	0.000			8.319
	0.000	71.669	-69.449	
	1.250	37.905	-0.965	
	1.250			8.319

22				
	1	0.000		6.312
		0.000	29.479	-0.671
		1.250	3.192	19.749
		1.250		6.312
	2	0.000		2.603
		0.000	10.697	-0.401
		1.250	1.216	7.044
		1.250		2.603
	3	0.000		11.738
		0.000	52.489	-1.446
		1.250	5.776	34.969
		1.250		11.738
	4	0.000		8.319
		0.000	37.905	-0.965
		1.250	4.142	25.315
		1.250		8.319
23				
	1	0.000		6.312
		0.000	3.192	19.749
		0.152	0.000	19.991
		1.250	-23.094	7.310
		1.250		6.312
	2	0.000		2.603
		0.000	1.216	7.044
		0.160	0.000	7.142
		1.250	-8.266	2.638
		1.250		2.603
	3	0.000		11.738
		0.000	5.776	34.969
		0.155	0.000	35.416
		1.250	-40.938	12.993
		1.250		11.738
	4	0.000	-	8.319
		0.000	4.142	25.315
		0.153	0.000	25.633
		1.250	-29.621	9.390
		1.250		8.319
24				
	1	0.000		6.312
		0.000	-23.094	7.310
		1.250	-49.380	-37.986
		1.250		6.312
	2	0.000		2.603
		0.000	-8.266	2.638
		1.250	-17.747	-13.620
		1.250		2.603
	3	0.000		11.738
		0.000	-40.938	12.993
		1.250	-87.651	-67.375
		1.250		11.738
	4	0.000		8.319
		0.000	-29.621	9.390
		1.250	-63.385	-48.738
		1.250		8.319
25				
	1	0.000		-0.557
		0.000	50.532	-40.125
		1.250	24.246	6.612
		1.250		-0.557
	2	0.000		-1.392
		0.000	18.494	-14.779
		1.250	9.013	2.412
		1.250		-1.392
	3	0.000		-2.897
		0.000	90.229	-71.797
		1.250	43.516	11.794
		1.250		-2.897
	4	0.000		-1.490
		0.000	65.080	-51.737
		1.250	31.317	8.510
		1.250		-1.490
26				
	1	0.000		-0.557

		0.000	24.246	6.612	
		1.153	0.000	20.590	
		1.250	-2.040	20.491	
		1.250			-0.557
	2	0.000			-1.392
		0.000	9.013	2.412	
		1.188	0.000	7.767	
		1.250	-0.469	7.752	
		1.250			-1.392
	3	0.000			-2.897
		0.000	43.516	11.794	
		1.164	0.000	37.129	
		1.250	-3.198	36.992	
		1.250			-2.897
	4	0.000			-1.490
		0.000	31.317	8.510	
		1.159	0.000	26.665	
		1.250	-2.447	26.554	
		1.250			-1.490
27	----------				
	1	0.000			-0.557
		0.000	-2.040	20.491	
		1.250	-28.326	1.512	
		1.250			-0.557
	2	0.000			-1.392
		0.000	-0.469	7.752	
		1.250	-9.950	1.241	
		1.250			-1.392
	3	0.000			-2.897
		0.000	-3.198	36.992	
		1.250	-49.911	3.799	
		1.250			-2.897
	4	0.000			-1.490
		0.000	-2.447	26.554	
		1.250	-36.210	2.394	
		1.250			-1.490
28	----------				
	1	0.000			-0.557
		0.000	-28.326	1.512	
		1.250	-54.613	-50.325	
		1.250			-0.557
	2	0.000			-1.392
		0.000	-9.950	1.241	
		1.250	-19.431	-17.122	
		1.250			-1.392
	3	0.000			-2.897
		0.000	-49.911	3.799	
		1.250	-96.625	-87.786	
		1.250			-2.897
	4	0.000			-1.490
		0.000	-36.210	2.394	
		1.250	-69.973	-63.971	
		1.250			-1.490
29	----------				
	1	0.000			-12.527
		0.000	32.003	-30.348	
		1.250	16.001	-0.346	
		1.250			-12.527
	2	0.000			-3.702
		0.000	7.585	-7.550	
		1.250	3.792	-0.439	
		1.250			-3.702
	3	0.000			-20.955
		0.000	50.539	-48.498	
		1.250	25.270	-1.118	
		1.250			-20.955
	4	0.000			-15.559
		0.000	38.533	-36.773	
		1.250	19.266	-0.648	
		1.250			-15.559
30	----------				
	1	0.000			-12.527
		0.000	16.001	-0.346	
		1.250	0.000	9.655	

	1.250			-12.527
2	0.000			-3.702
	0.000	3.793	-0.439	
	1.250	0.000	1.931	
	1.250			-3.702
3	0.000			-20.955
	0.000	25.270	-1.118	
	1.250	0.000	14.676	
	1.250			-20.955
4	0.000			-15.559
	0.000	19.266	-0.648	
	1.250	0.000	11.393	
	1.250			-15.559

31 ----------

1	0.000			-12.527
	0.000	0.000	9.655	
	1.250	-16.001	-0.346	
	1.250			-12.527
2	0.000			-3.702
	0.000	0.000	1.931	
	1.250	-3.793	-0.439	
	1.250			-3.702
3	0.000			-20.955
	0.000	0.000	14.676	
	1.250	-25.269	-1.118	
	1.250			-20.955
4	0.000			-15.559
	0.000	0.000	11.393	
	1.250	-19.266	-0.648	
	1.250			-15.559

32 ----------

1	0.000			-12.527
	0.000	-16.001	-0.346	
	1.250	-32.003	-30.348	
	1.250			-12.527
2	0.000			-3.702
	0.000	-3.793	-0.439	
	1.250	-7.585	-7.550	
	1.250			-3.702
3	0.000			-20.955
	0.000	-25.270	-1.118	
	1.250	-50.539	-48.498	
	1.250			-20.955
4	0.000			-15.559
	0.000	-19.266	-0.648	
	1.250	-38.533	-36.773	
	1.250			-15.559

33 ----------

1	0.000			-0.557
	0.000	54.613	-50.325	
	1.250	28.326	1.512	
	1.250			-0.557
2	0.000			-1.392
	0.000	19.431	-17.122	
	1.250	9.950	1.241	
	1.250			-1.392
3	0.000			-2.897
	0.000	96.625	-87.786	
	1.250	49.911	3.799	
	1.250			-2.897
4	0.000			-1.490
	0.000	69.973	-63.971	
	1.250	36.210	2.394	
	1.250			-1.490

34 ----------

1	0.000			-0.557
	0.000	28.326	1.512	
	1.250	2.040	20.491	
	1.250			-0.557
2	0.000			-1.392
	0.000	9.950	1.241	
	1.250	0.469	7.752	
	1.250			-1.392

	3	0.000		-2.897
		0.000	49.911	3.799
		1.250	3.198	36.992
		1.250		-2.897
	4	0.000		-1.490
		0.000	36.210	2.394
		1.250	2.447	26.554
		1.250		-1.490
35	----------			
	1	0.000		-0.557
		0.000	2.040	20.491
		0.097	0.000	20.590
		1.250	-24.246	6.612
		1.250		-0.557
	2	0.000		-1.392
		0.000	0.469	7.752
		0.062	0.000	7.767
		1.250	-9.013	2.412
		1.250		-1.392
	3	0.000		-2.897
		0.000	3.198	36.992
		0.086	0.000	37.129
		1.250	-43.516	11.794
		1.250		-2.897
	4	0.000		-1.490
		0.000	2.447	26.554
		0.091	0.000	26.665
		1.250	-31.317	8.510
		1.250		-1.490
36	----------			
	1	0.000		-0.557
		0.000	-24.246	6.612
		1.250	-50.532	-40.125
		1.250		-0.557
	2	0.000		-1.392
		0.000	-9.013	2.412
		1.250	-18.494	-14.779
		1.250		-1.392
	3	0.000		-2.897
		0.000	-43.516	11.794
		1.250	-90.229	-71.797
		1.250		-2.897
	4	0.000		-1.490
		0.000	-31.317	8.510
		1.250	-65.080	-51.737
		1.250		-1.490
37	----------			
	1	0.000		-13.900
		0.000	31.681	-23.074
		1.250	15.679	6.526
		1.250		-13.900
	2	0.000		-4.047
		0.000	7.524	-5.670
		1.250	3.731	1.365
		1.250		-4.047
	3	0.000		-23.155
		0.000	50.055	-36.760
		1.250	24.785	10.014
		1.250		-23.155
	4	0.000		-17.226
		0.000	38.155	-27.913
		1.250	18.889	7.739
		1.250		-17.226
38	----------			
	1	0.000		-13.900
		0.000	15.679	6.526
		1.225	0.000	16.128
		1.250	-0.322	16.124
		1.250		-13.900
	2	0.000		-4.047
		0.000	3.731	1.365
		1.250	-0.061	3.658
		1.250		-4.047

3	0.000			-23.155
	0.000	24.785	10.014	
	1.250	-0.484	25.202	
	1.250			-23.155
4	0.000			-17.226
	0.000	18.889	7.739	
	1.250	-0.378	19.308	
	1.250			-17.226

39 ----------

1	0.000			-13.900
	0.000	-0.322	16.124	
	1.250	-16.323	5.721	
	1.250			-13.900
2	0.000			-4.047
	0.000	-0.061	3.658	
	1.250	-3.854	1.211	
	1.250			-4.047
3	0.000			-23.155
	0.000	-0.484	25.202	
	1.250	-25.754	8.803	
	1.250			-23.155
4	0.000			-17.226
	0.000	-0.378	19.308	
	1.250	-19.644	6.794	
	1.250			-17.226

40 ----------

1	0.000			-13.900
	0.000	-16.323	5.721	
	1.250	-32.324	-24.684	
	1.250			-13.900
2	0.000			-4.047
	0.000	-[illegible].854	1.211	
	1.250	-7.646	-5.976	
	1.250			-4.047
3	0.000			-23.155
	0.000	-25.754	8.803	
	1.250	-51.023	-39.183	
	1.250			-23.155
4	0.000			-17.226
	0.000	-19.644	6.794	
	1.250	-38.911	-29.803	
	1.250			-17.226

41 ----------

1	0.000			-13.900
	0.000	32.324	-24.684	
	1.250	16.323	5.721	
	1.250			-13.900
2	0.000			-4.047
	0.000	7.646	-5.976	
	1.250	3.854	1.211	
	1.250			-4.047
3	0.000			-23.155
	0.000	51.023	-39.183	
	1.250	25.754	8.803	
	1.250			-23.155
4	0.000			-17.226
	0.000	38.911	-29.803	
	1.250	19.644	6.794	
	1.250			-17.226

42 ----------

1	0.000			-13.900
	0.000	16.323	5.721	
	1.250	0.322	16.124	
	1.250			-13.900
2	0.000			-4.047
	0.000	3.854	1.211	
	1.250	0.061	3.658	
	1.250			-4.047
3	0.000			-23.155
	0.000	25.754	8.803	
	1.250	0.484	25.202	
	1.250			-23.155
4	0.000			-17.226

```
        0.000      19.644       6.794                                  1.250                    -17.226
        1.250       0.378      19.308
        1.250                            -17.226
43 ----------------------------------------
    1   0.000                            -13.900
        0.000       0.322      16.124
        0.025       0.000      16.128
        1.250     -15.679       6.526
        1.250                            -13.900

    2   0.000                             -4.047
        0.000       0.061       3.658
        1.250      -3.731       1.365
        1.250                             -4.047

    3   0.000                            -23.155
        0.000       0.484      25.202
        1.250     -24.785      10.014
        1.250                            -23.155

    4   0.000                            -17.226
        0.000       0.378      19.308
        1.250     -18.889       7.739
        1.250                            -17.226
44 ----------------------------------------
    1   0.000                            -13.900
        0.000     -15.679       6.526
        1.250     -31.681     -23.074
        1.250                            -13.900

    2   0.000                             -4.047
        0.000      -3.731       1.365
        1.250      -7.524      -5.670
        1.250                             -4.047

    3   0.000                            -23.155
        0.000     -24.785      10.014
        1.250     -50.055     -36.760
        1.250                            -23.155

    4   0.000                            -17.226
        0.000     -18.889       7.739
        1.250     -38.155     -27.913
```

Lampiran 15. Input analisis S2-3 dengan SAP 90

```
Struktur 2-3

SYSTEM
L=2

JOINTS
1   x=0      y=0     z=0       : bidang koordinat X-Y
4   x=0      y=9           g=1,4,1
5   x=1.25   y=3
7   x=1.25   y=9           g=5,7,1
8   x=2.5    y=3
10  x=2.5    y=9           g=8,10,1
11  x=3.75   y=3
13  x=3.75   y=9           g=11,13,1
14  x=5      y=0
17  x=5      y=9           g=14,17,1
18  x=6.25   y=3
19  x=6.25   y=6
20  x=7.5    y=3
21  x=7.5    y=6
22  x=8.75   y=3
23  x=8.75   y=6
24  x=10     y=0
27  x=10     y=9           g=24,27,1
28  x=11.25  y=3
30  x=11.25  y=9           g=28,30,1
31  x=12.5   y=3
33  x=12.5   y=9           g=31,33,1
34  x=13.75  y=3
36  x=13.75  y=9           g=34,36,1
37  x=15     y=0
40  x=15     y=9           g=37,40,1

RESTRAINTS
1,40,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
14      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
24      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
37      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y

FRAME
NM=9   NL=4      Y=-1,0
C PROPERTIES POTONGAN
1  A=0.047446  I=0.000654851536  E=2.35E7          : MATERIAL BALOK
2  A=0.049190  I=0.000688296928
3  A=0.058321  I=0.000876466860
4  A=0.034903  I=0.000417296577
5  A=0.026151  I=0.000251437242
6  A=0.029878  I=0.000320648554
7  A=0.032483  I=0.000370280080
8  A=0.048121  I=0.000681670695
9  A=0.059527  I=0.000806961500  E=2.35E7 W=3.016 : MATERIAL KOLOM
C BEBAN MATI
1  WG=0,-21.029,0
2  WG=0,-12.801,0
C BEBAN HIDUP
```

```
3  WG=0,-7.585,0
4  WG=0,-3.034,0
C KOLOM
1,1,2       M=9  G=2,4,1,1  LP=1,1
2,14,15     M=9  G=1,1,10,10
4,37,38     M=9  G=2,4,1,1
6,13,16     M=9  G=1,4,1,1
7,25,26     M=9  G=1,4,1,1
C BALOK
13,2,5      M=1  G=1,11,32,33  NSL=1,3
14,5,8      M=4  G=1,1,3,3     NSL=1,3
16,11,15    M=3  G=1,5,14,13   NSL=1,3
17,15,18    M=3  G=1,3,7,7     NSL=1,3
18,18,20    M=7  G=1,1,2,2     NSL=1,3
22,28,31    M=4  G=1,1,3,3     NSL=1,3
25,3,6      M=2  G=1,11,32,33  NSL=1,3
26,6,9      M=4  G=1,1,3,3     NSL=1,3
28,12,16    M=3  G=1,5,14,13   NSL=1,3
29,16,19    M=8  G=1,3,7,7     NSL=2,4
30,19,21    M=5  G=1,1,2,2     NSL=2,4
34,29,32    M=4  G=1,1,3,3     NSL=1,3
37,4,7      M=4  G=1,3,9,10    NSL=2,4
38,7,10     M=6  G=1,1,3,3     NSL=2,4
41,27,30    M=4  G=1,3,9,10    NSL=2,4
42,30,33    M=6  G=1,1,3,3     NSL=2,4

COMBO
1 C=1
2 C=0,1
3 C=1.2,1.6
4 C=1.05,0.65
```

Lampiran 16. Output analisis S2-3 dengan SAP 90

```
PROGRAM:SAP90/FILE:s2-3B.F3F
 Struktur 2-3

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

   ELT LOAD    DIST          1-2 PLANE       AXIAL
    ID COMB    ENDI       SHEAR     MOMENT   FORCE
     1 ---------------------------------------------
         1   0.000                          -158.244
             0.000      -8.403      8.583
             3.000      -8.403    -16.625
             3.000                          -149.196

         2   0.000                           -43.610
             0.000      -2.922      2.985
             3.000      -2.922     -5.782
             3.000                           -43.610

         3   0.000                          -259.670
             0.000     -14.759     15.076
             3.000     -14.759    -29.201
             3.000                          -248.812

         4   0.000                          -194.503
             0.000     -10.722     10.953
             3.000     -10.722    -21.214
             3.000                          -185.003
     2 ---------------------------------------------
         1   0.000                          -254.914
             0.000       0.575     -0.528
             3.000       0.575      1.198
             3.000                          -245.866

         2   0.000                           -73.957
             0.000      -0.020      0.027
             3.000      -0.020     -0.033
             3.000                           -73.957

         3   0.000                          -424.228
             0.000       0.659     -0.590
             3.000       0.659      1.385
             3.000                          -413.370

         4   0.000                          -315.731
             0.000       0.591     -0.537
             3.000       0.591      1.237
             3.000                          -306.231
     3 ---------------------------------------------
         1   0.000                          -254.914
             0.000      -0.575      0.528
             3.000      -0.575     -1.198
             3.000                          -245.866

         2   0.000                           -73.957
             0.000       0.020     -0.027
             3.000       0.020      0.033
             3.000                           -73.957

         3   0.000                          -424.228
             0.000      -0.659      0.590
             3.000      -0.659     -1.385
             3.000                          -413.370

         4   0.000                          -315.731
             0.000      -0.591      0.537
             3.000      -0.591     -1.237
             3.000                          -306.231
     4 ---------------------------------------------
         1   0.000                          -158.244
             0.000       8.403     -8.583
             3.000       8.403     16.625
             3.000                          -149.196

         2   0.000                           -43.610
             0.000       2.922     -2.985
             3.000       2.922      5.782
             3.000                           -43.610

         3   0.000                          -259.670
             0.000      14.759    -15.076
             3.000      14.759     29.201
             3.000                          -248.812

         4   0.000                          -194.503
             0.000      10.722    -10.953
             3.000      10.722     21.214
```

	3.000			-185.003
5	----------			
1	0.000			-99.875
	0.000	-14.616	22.315	
	3.000	-14.616	-21.534	
	3.000			-90.827
2	0.000			-25.884
	0.000	-5.522	8.181	
	3.000	-5.522	-8.384	
	3.000			-25.884
3	0.000			-161.264
	0.000	-26.374	39.868	
	3.000	-26.374	-39.256	
	3.000			-150.407
4	0.000			-121.693
	0.000	-18.936	28.749	
	3.000	-18.936	-28.060	
	3.000			-112.193
6	----------			
1	0.000			-137.469
	0.000	2.380	-3.259	
	3.000	2.380	3.880	
	3.000			-128.421
2	0.000			-34.796
	0.000	1.921	-1.970	
	3.000	1.921	3.793	
	3.000			-34.796
3	0.000			-220.637
	0.000	5.929	-7.062	
	3.000	5.929	10.724	
	3.000			-209.779
4	0.000			-166.960
	0.000	3.747	-4.702	
	3.000	3.747	6.539	
	3.000			-157.460
7	----------			
1	0.000			-137.469
	0.000	-2.380	3.259	
	3.000	-2.380	-3.880	
	3.000			-128.421
2	0.000			-34.796
	0.000	-1.921	1.970	
	3.000	-1.921	-3.793	
	3.000			-34.796
3	0.000			-220.637
	0.000	-5.929	7.062	
	3.000	-5.929	-10.724	
	3.000			-209.779
4	0.000			-166.960
	0.000	-3.747	4.702	
	3.000	-3.747	-6.539	
	3.000			-157.460
8	----------			
1	0.000			-99.875
	0.000	14.616	-22.315	
	3.000	14.616	21.534	
	3.000			-90.827
2	0.000			-25.884
	0.000	5.522	-8.181	
	3.000	5.522	8.384	
	3.000			-25.884
3	0.000			-161.264
	0.000	26.374	-39.868	
	3.000	26.374	39.256	
	3.000			-150.407
4	0.000			-121.693
	0.000	18.936	-28.749	
	3.000	18.936	28.060	
	3.000			-112.193
9	----------			
1	0.000			-40.761
	0.000	-14.582	19.378	
	3.000	-14.582	-24.367	
	3.000			-31.713

```
    2   0.000                          -7.536
        0.000      -4.238       6.723
        3.000      -4.238      -5.992
        3.000                          -7.536

    3   0.000                         -60.972
        0.000     -24.279      34.011
        3.000     -24.279     -38.828
        3.000                         -50.114

    4   0.000                         -47.698
        0.000     -18.066      24.717
        3.000     -18.066     -29.480
        3.000                         -38.197
10 ----------------------------------------
    1   0.000                         -41.340
        0.000      14.582     -17.931
        3.000      14.582      25.814
        3.000                         -32.292

    2   0.000                          -7.634
        0.000       4.238      -6.480
        3.000       4.238       6.235
        3.000                          -7.634

    3   0.000                         -61.822
        0.000      24.279     -31.886
        3.000      24.279      40.952
        3.000                         -50.964

    4   0.000                         -48.369
        0.000      18.066     -23.040
        3.000      18.066      31.157
        3.000                         -38.868
11 ----------------------------------------
    1   0.000                         -41.340
        0.000     -14.582      17.931
        3.000     -14.582     -25.814
        3.000                         -32.292

    2   0.000                          -7.634
        0.000      -4.238       6.480
        3.000      -4.238      -6.235
```

```
        3.000                          -7.634

    3   0.000                         -61.822
        0.000     -24.279      31.886
        3.000     -24.279     -40.952
        3.000                         -50.964

    4   0.000                         -48.369
        0.000     -18.066      23.040
        3.000     -18.066     -31.157
        3.000                         -38.868
12 ----------------------------------------
    1   0.000                         -40.761
        0.000      14.582     -19.378
        3.000      14.582      24.367
        3.000                         -31.713

    2   0.000                          -7.536
        0.000       4.238      -6.723
        3.000       4.238       5.992
        3.000                          -7.536

    3   0.000                         -60.972
        0.000      24.279     -34.011
        3.000      24.279      38.828
        3.000                         -50.114

    4   0.000                         -47.698
        0.000      18.066     -24.717
        3.000      18.066      29.480
        3.000                         -38.197
13 ----------------------------------------
    1   0.000                           6.214
        0.000      49.321     -38.940
        1.250      23.035       6.283
        1.250                           6.214

    2   0.000                           2.599
        0.000      17.727     -13.963
        1.250       8.245       2.269
        1.250                           2.599

    3   0.000                          11.615
```

	0.000	87.548	-69.069	
	1.250	40.834	11.170	
	1.250			11.615
4	0.000			8.214
	0.000	63.309	-49.963	
	1.250	29.546	8.072	
	1.250			8.214

14 ----------

1	0.000			6.214
	0.000	23.035	6.283	
	1.095	0.000	18.899	
	1.250	-3.251	18.647	
	1.250			6.214
2	0.000			2.599
	0.000	8.245	2.269	
	1.087	0.000	6.751	
	1.250	-1.236	6.650	
	1.250			2.599
3	0.000			11.615
	0.000	40.834	11.170	
	1.093	0.000	33.479	
	1.250	-5.879	33.017	
	1.250			11.615
4	0.000			8.214
	0.000	29.546	8.072	
	1.094	0.000	24.231	
	1.250	-4.217	23.902	
	1.250			8.214

15 ----------

1	0.000			6.214
	0.000	-3.251	18.647	
	1.250	-29.538	-1.846	
	1.250			6.214
2	0.000			2.599
	0.000	-1.236	6.650	
	1.250	-10.717	-0.821	
	1.250			2.599
3	0.000			11.615
	0.000	-5.879	33.017	
	1.250	-52.593	-3.528	
	1.250			11.615
4	0.000			8.214
	0.000	-4.217	23.902	
	1.250	-37.981	-2.472	
	1.250			8.214

16 ----------

1	0.000			6.214
	0.000	-29.538	-1.846	
	1.250	-55.824	-55.197	
	1.250			6.214
2	0.000			2.599
	0.000	-10.717	-0.821	
	1.250	-20.198	-20.143	
	1.250			2.599
3	0.000			11.615
	0.000	-52.593	-3.528	
	1.250	-99.306	-98.465	
	1.250			11.615
4	0.000			8.214
	0.000	-37.981	-2.472	
	1.250	-71.744	-71.050	
	1.250			8.214

17 ----------

1	0.000			4.409
	0.000	52.572	-50.740	
	1.250	26.286	-1.453	
	1.250			4.409
2	0.000			0.659
	0.000	18.962	-18.206	
	1.250	9.481	-0.428	
	1.250			0.659
3	0.000			6.345
	0.000	93.427	-90.017	
	1.250	46.713	-2.429	

		1.250		6.345
	4	0.000		5.058
		0.000	67.527	-65.111
		1.250	33.763	-1.804
		1.250		5.058
18				
	1	0.000		4.409
		0.000	26.286	-1.453
		1.250	0.000	14.976
		1.250		4.409
	2	0.000		0.659
		0.000	9.481	-0.428
		1.250	0.000	5.497
		1.250		0.659
	3	0.000		6.345
		0.000	46.714	-2.429
		1.250	0.000	26.766
		1.250		6.345
	4	0.000		5.058
		0.000	33.763	-1.804
		1.250	0.000	19.298
		1.250		5.058
19				
	1	0.000		4.409
		0.000	0.000	14.976
		1.250	-26.286	-1.453
		1.250		4.409
	2	0.000		0.659
		0.000	0.000	5.497
		1.250	-9.481	-0.428
		1.250		0.659
	3	0.000		6.345
		0.000	0.000	26.766
		1.250	-46.713	-2.429
		1.250		6.345
	4	0.000		5.058
		0.000	0.000	19.298
		1.250	-33.763	-1.804
		1.250		5.058
20				
	1	0.000		4.409
		0.000	-26.286	-1.453
		1.250	-52.573	-50.740
		1.250		4.409
	2	0.000		0.659
		0.000	-9.481	-0.428
		1.250	-18.963	-18.206
		1.250		0.659
	3	0.000		6.345
		0.000	-46.714	-2.429
		1.250	-93.427	-90.017
		1.250		6.345
	4	0.000		5.058
		0.000	-33.763	-1.804
		1.250	-67.527	-65.111
		1.250		5.058
21				
	1	0.000		6.214
		0.000	55.824	-55.197
		1.250	29.538	-1.846
		1.250		6.214
	2	0.000		2.599
		0.000	20.198	-20.143
		1.250	10.717	-0.821
		1.250		2.599
	3	0.000		11.615
		0.000	99.306	-98.465
		1.250	52.593	-3.528
		1.250		11.615
	4	0.000		8.214
		0.000	71.744	-71.050
		1.250	37.981	-2.472
		1.250		8.214

22 ----------

1	0.000		6.214
	0.000	21.538	-1.846
	1.250	3.251	18.647
	1.250		6.214
2	0.000		2.599
	0.000	10.717	-0.821
	1.250	1.236	6.650
	1.250		2.599
3	0.000		11.615
	0.000	52.593	-3.528
	1.250	5.879	33.017
	1.250		11.615
4	0.000		8.214
	0.000	37.981	-2.472
	1.250	4.217	23.902
	1.250		8.214

23 ----------

1	0.000		6.214
	0.000	3.251	18.647
	0.155	0.000	18.899
	1.250	-23.035	6.283
	1.250		6.214
2	0.000		2.599
	0.000	1.236	6.650
	0.163	0.000	6.751
	1.250	-8.245	2.269
	1.250		2.599
3	0.000		11.615
	0.000	5.879	33.017
	0.157	0.000	33.479
	1.250	-40.834	11.170
	1.250		11.615
4	0.000		8.214
	0.000	4.217	23.902
	0.156	0.000	24.231
	1.250	-29.546	8.072
	1.250		8.214

24 ----------

1	0.000		6.214
	0.000	-23.035	6.283
	1.250	-49.321	-38.940
	1.250		6.214
2	0.000		2.599
	0.000	-8.245	2.269
	1.250	-17.727	-13.963
	1.250		2.599
3	0.000		11.615
	0.000	-40.834	11.170
	1.250	-87.548	-69.069
	1.250		11.615
4	0.000		8.214
	0.000	-29.546	8.072
	1.250	-63.309	-49.963
	1.250		8.214

25 ----------

1	0.000		-0.034
	0.000	50.066	-40.912
	1.250	23.780	5.242
	1.250		-0.034
2	0.000		-1.284
	0.000	18.347	-15.107
	1.250	8.866	1.901
	1.250		-1.284
3	0.000		-2.095
	0.000	89.435	-73.266
	1.250	42.722	9.332
	1.250		-2.095
4	0.000		-0.870
	0.000	64.495	-52.778
	1.250	30.732	6.739
	1.250		-0.870

26 ----------

1	0.000		-0.034

	0.000	23.780	5.242	
	1.131	0.000	18.687	
	1.250	-2.506	18.538	
	1.250			-0.034
2	0.000			-1.284
	0.000	8.866	1.901	
	1.169	0.000	7.083	
	1.250	-0.615	7.058	
	1.250			-1.284
3	0.000			-2.095
	0.000	42.722	9.332	
	1.143	0.000	33.751	
	1.250	-3.992	33.538	
	1.250			-2.095
4	0.000			-0.870
	0.000	30.732	6.739	
	1.138	0.000	24.222	
	1.250	-3.031	24.052	
	1.250			-0.870
27	----------			
1	0.000			-0.034
	0.000	-2.506	18.538	
	1.250	-28.793	-1.024	
	1.250			-0.034
2	0.000			-1.284
	0.000	-0.615	7.058	
	1.250	-10.096	0.363	
	1.250			-1.284
3	0.000			-2.095
	0.000	-3.992	33.538	
	1.250	-50.705	-0.648	
	1.250			-2.095
4	0.000			-0.870
	0.000	-3.031	24.052	
	1.250	-36.795	-0.839	
	1.250			-0.870
28	----------			

1	0.000			-0.034
	0.000	-28.793	-1.024	
	1.250	-55.079	-53.444	
	1.250			-0.034
2	0.000			-1.284
	0.000	-10.096	0.363	
	1.250	-19.578	-18.183	
	1.250			-1.284
3	0.000			-2.095
	0.000	-50.705	-0.648	
	1.250	-97.419	-93.225	
	1.250			-2.095
4	0.000			-0.870
	0.000	-36.795	-0.839	
	1.250	-70.558	-67.935	
	1.250			-0.870
29	----------			
1	0.000			-12.237
	0.000	32.002	-31.633	
	1.250	16.001	-1.630	
	1.250			-12.237
2	0.000			-3.601
	0.000	7.585	-7.910	
	1.250	3.792	-0.799	
	1.250			-3.601
3	0.000			-20.446
	0.000	50.539	-50.615	
	1.250	25.269	-3.235	
	1.250			-20.446
4	0.000			-15.189
	0.000	38.533	-38.356	
	1.250	19.266	-2.231	
	1.250			-15.189
30	----------			
1	0.000			-12.237
	0.000	16.001	-1.630	
	1.250	0.000	8.371	

	1.250			-12.237
2	0.000			-3.601
	0.000	3.792	-0.799	
	1.250	0.000	1.571	
	1.250			-3.601
3	0.000			-20.446
	0.000	25.269	-3.235	
	1.250	0.000	12.559	
	1.250			-20.446
4	0.000			-15.189
	0.000	19.266	-2.231	
	1.250	0.000	9.810	
	1.250			-15.189

31 ----------

1	0.000			-12.237
	0.000	0.000	8.371	
	1.250	-16.001	-1.630	
	1.250			-12.237
2	0.000			-3.601
	0.000	0.000	1.571	
	1.250	-3.793	-0.799	
	1.250			-3.601
3	0.000			-20.446
	0.000	0.000	12.559	
	1.250	-25.270	-3.235	
	1.250			-20.446
4	0.000			-15.189
	0.000	0.000	9.810	
	1.250	-19.266	-2.231	
	1.250			-15.189

32 ----------

1	0.000			-12.237
	0.000	-16.001	-1.630	
	1.250	-32.002	-31.633	
	1.250			-12.237
2	0.000			-3.601
	0.000	-3.793	-0.799	
	1.250	-7.585	-7.910	
	1.250			-3.601
3	0.000			-20.446
	0.000	-25.269	-3.235	
	1.250	-50.539	-50.615	
	1.250			-20.446
4	0.000			-15.189
	0.000	-19.266	-2.231	
	1.250	-38.533	-38.356	
	1.250			-15.189

33 ----------

1	0.000			-0.034
	0.000	55.079	-53.444	
	1.250	28.793	-1.024	
	1.250			-0.034
2	0.000			-1.284
	0.000	19.578	-18.183	
	1.250	10.096	0.363	
	1.250			-1.284
3	0.000			-2.095
	0.000	97.419	-93.225	
	1.250	50.705	-0.648	
	1.250			-2.095
4	0.000			-0.870
	0.000	70.558	-67.935	
	1.250	36.795	-0.839	
	1.250			-0.870

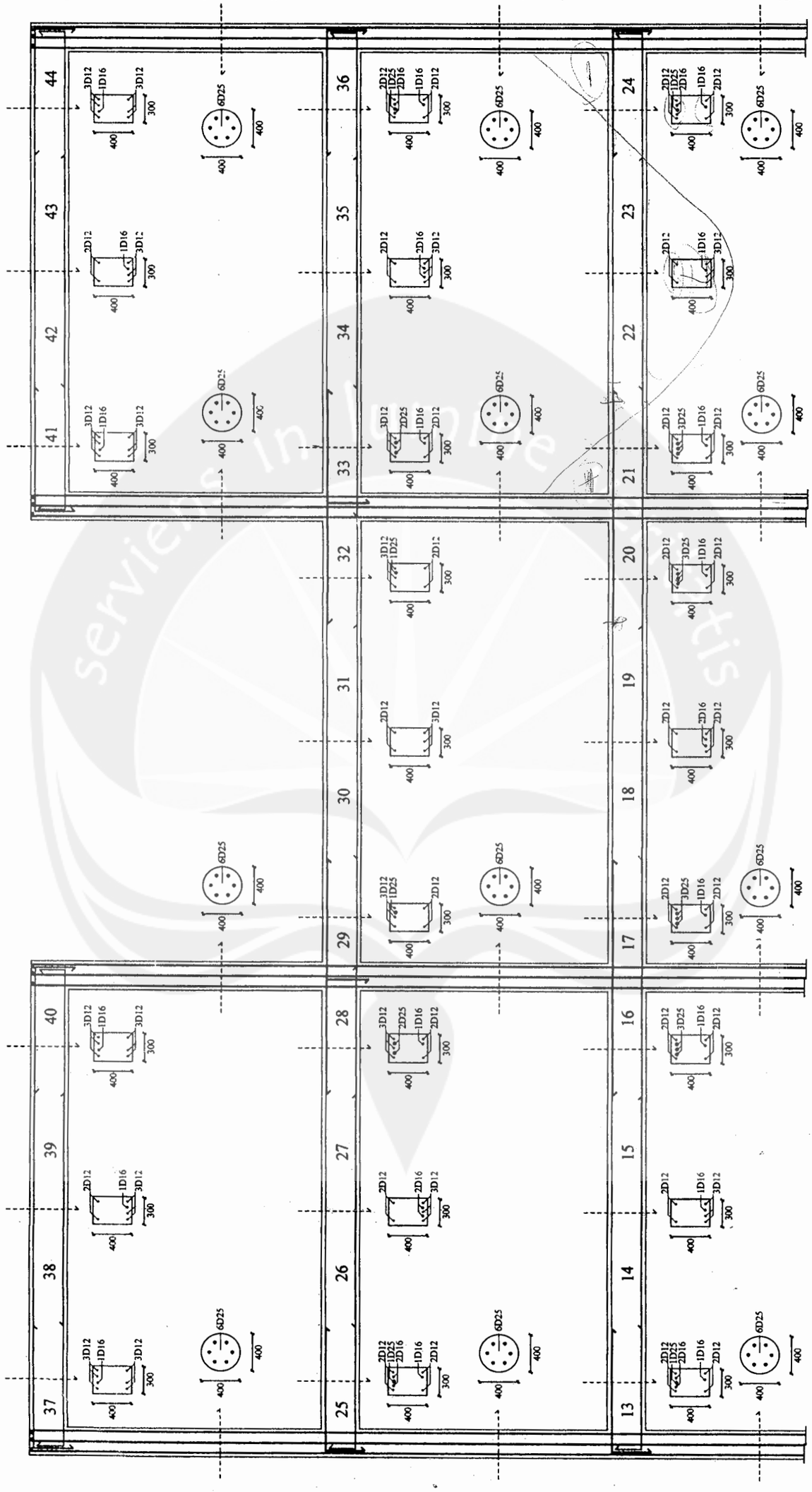
34 ----------

1	0.000			-0.034
	0.000	28.793	-1.024	
	1.250	2.506	18.538	
	1.250			-0.034
2	0.000			-1.284
	0.000	10.096	0.363	
	1.250	0.615	7.058	
	1.250			-1.284

	3	0.000		-2.095
		0.000	50.705	-0.648
		1.250	3.992	33.538
		1.250		-2.095
	4	0.000		-0.870
		0.000	36.795	-0.839
		1.250	3.031	24.052
		1.250		-0.870
35				
	1	0.000		-0.034
		0.000	2.506	18.538
		0.119	0.000	18.687
		1.250	-23.780	5.242
		1.250		-0.034
	2	0.000		-1.284
		0.000	0.615	7.058
		0.081	0.000	7.083
		1.250	-8.866	1.901
		1.250		-1.284
	3	0.000		-2.095
		0.000	3.992	33.538
		0.107	0.000	33.751
		1.250	-42.722	9.332
		1.250		-2.095
	4	0.000		-0.870
		0.000	3.031	24.052
		0.112	0.000	24.222
		1.250	-30.732	6.739
		1.250		-0.870
36				
	1	0.000		-0.034
		0.000	-23.780	5.242
		1.250	-50.066	-40.912
		1.250		-0.034
	2	0.000		-1.284
		0.000	-8.866	1.901
		1.250	-18.347	-15.107
		1.250		-1.284
	3	0.000		-2.095
		0.000	-42.722	9.332
		1.250	-89.435	-73.266
		1.250		-2.095
	4	0.000		-0.870
		0.000	-30.732	6.739
		1.250	-64.495	-52.778
		1.250		-0.870
37				
	1	0.000		-14.582
		0.000	31.711	24.167
		1.250	15.712	5.274
		1.250		-14.582
	2	0.000		-4.238
		0.000	7.536	-5.992
		1.250	3.744	1.058
		1.250		-4.238
	3	0.000		-24.279
		0.000	50.114	-38.828
		1.250	24.845	8.022
		1.250		-24.279
	4	0.000		-18.066
		0.000	38.197	-29.480
		1.250	18.931	6.225
		1.250		-18.066
38				
	1	0.000		-14.582
		0.000	15.712	5.274
		1.250	-0.289	14.913
		1.250		-14.582
	2	0.000		-4.238
		0.000	3.744	1.058
		1.250	-0.049	3.368
		1.250		-4.238
	3	0.000		-24.279

		0.000	24.845	8.022	
		1.250	-0.425	23.284	
		1.250			-24.279
	4	0.000			-18.066
		0.000	18.931	6.225	
		1.250	-0.335	17.847	
		1.250			-18.066
39	----------				
	1	0.000			-14.582
		0.000	-0.289	14.913	
		1.250	-16.291	4.550	
		1.250			-14.582
	2	0.000			-4.238
		0.000	-0.049	3.368	
		1.250	-3.841	0.937	
		1.250			-4.238
	3	0.000			-24.279
		0.000	-0.425	23.284	
		1.250	-25.694	6.959	
		1.250			-24.279
	4	0.000			-18.066
		0.000	-0.335	17.847	
		1.250	-19.602	5.387	
		1.250			-18.066
40	----------				
	1	0.000			-14.582
		0.000	-16.291	4.550	
		1.250	-32.292	-25.814	
		1.250			-14.582
	2	0.000			-4.238
		0.000	-3.841	0.937	
		1.250	-7.634	-6.235	
		1.250			-4.238
	3	0.000			-24.279
		0.000	-25.694	6.959	
		1.250	-50.964	-40.952	
		1.250			-24.279
	4	0.000			-18.066
		0.000	-19.602	5.387	
		1.250	-38.868	-31.157	
		1.250			-18.066
41	----------				
	1	0.000			-14.582
		0.000	32.292	-25.814	
		1.250	16.291	4.550	
		1.250			-14.582
	2	0.000			-4.238
		0.000	7.634	-6.235	
		1.250	3.841	0.937	
		1.250			-4.238
	3	0.000			-24.279
		0.000	50.964	-40.952	
		1.250	25.694	6.959	
		1.250			-24.279
	4	0.000			-18.066
		0.000	38.868	-31.157	
		1.250	19.602	5.387	
		1.250			-18.066
42	----------				
	1	0.000			-14.582
		0.000	16.291	4.550	
		1.250	0.289	14.913	
		1.250			-14.582
	2	0.000			-4.238
		0.000	3.841	0.937	
		1.250	0.049	3.368	
		1.250			-4.238
	3	0.000			-24.279
		0.000	25.694	6.959	
		1.250	0.425	23.284	
		1.250			-24.279
	4	0.000			-18.066
		0.000	19.602	5.387	
		1.250	0.335	17.847	

```
        1.250                          -18.066
43 ----------------------------------------------
     1  0.000                          -14.582
        0.000        0.289       14.913
        1.250      -15.712        5.274
        1.250                          -14.582

     2  0.000                           -4.238
        0.000        0.049        3.368
        1.250       -3.744        1.058
        1.250                           -4.238

     3  0.000                          -24.279
        0.000        0.425       23.284
        1.250      -24.845        8.022
        1.250                          -24.279

     4  0.000                          -18.066
        0.000        0.335       17.847
        1.250      -18.931        6.225
        1.250                          -18.066
44 ----------------------------------------------
     1  0.000                          -14.582
        0.000      -15.712        5.274
        1.250      -31.713      -24.367
        1.250                          -14.582

     2  0.000                           -4.238
        0.000       -3.744        1.058
        1.250       -7.536       -5.992
        1.250                           -4.238

     3  0.000                          -24.279
        0.000      -24.845        8.022
        1.250      -50.114      -38.828
        1.250                          -24.279

     4  0.000                          -18.066
        0.000      -18.931        6.225
        1.250      -38.197      -29.480
        1.250                          -18.066
```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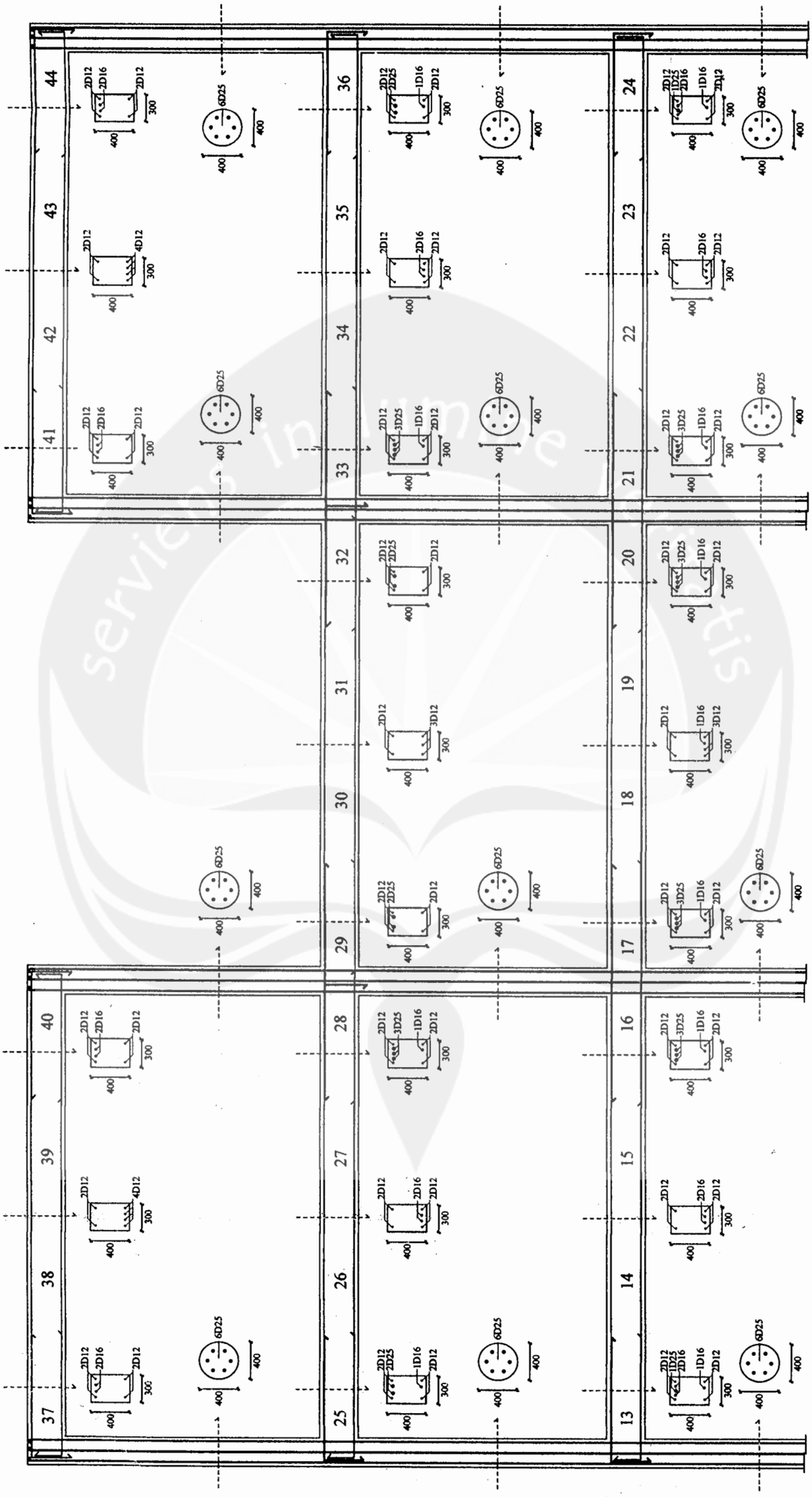
3D12
1D16
2D12
1D25
2D25
3D25
6D25
400
300

Skala 1:50

Lampiran 18. Detail penulangan kolom dan balok struktur (S2-2)



Skala 1:50

Lampiran 19. Input analisis S3-1 dengan SAP 90

```
Struktur 3-1

SYSTEM
L=2

JOINTS
1   x=0      y=0     z=0       : bidang koordinat X-Y
3   x=0      y=6           g=1,3,1
4   x=1.25   y=3
5   x=1.25   y=6
8   x=3.75   y=3           g=4,8,2
9   x=3.75   y=6           g=5,9,2
10  x=5      y=0
13  x=5      y=9           g=10,13,1
14  x=6.25   y=3
16  x=6.25   y=9           g=14,16,1
17  x=7.5    y=3
19  x=7.5    y=9           g=17,19,1
20  x=8.75   y=3
22  x=8.75   y=9           g=20,22,1
23  x=10     y=0
26  x=10     y=9           g=23,26,1
27  x=11.25  y=3
31  x=13.75  y=3           g=27,31,2
28  x=11.25  y=6
32  x=13.75  y=6           g=28,32,2
33  x=15     y=0
35  x=15     y=6           g=33,35,1

RESTRAINTS
1,35,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
10      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
23      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
33      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y

FRAME
NM=2   NL=4      Y=-1,0
C PROPERTIES POTONGAN
1  SH=R T=0.3,0.30  E=2.35E7 W=2.16          : MATERIAL KOLOM
2  SH=R T=0.4,0.30  E=2.35E7                 : MATERIAL BALOK
C BEBAN MATI
1  WG=0,-21.029,0
2  WG=0,-12.801,0
C BEBAN HIDUP
3  WG=0,-7.585,0
4  WG=0,-3.034,0
C KOLOM
1,1,2       M=1  G=1,4,1,1  LP=1,0
2,10,11          G=1,4,1,1
3,23,24          G=1,4,1,1
```

```
4,33,34          G=1,4,1,1
9,12,13          G=1,1,13,13
C BALIK
11,3,4      M=2  G=2,1,2,2  NSL=1,3
14,6,11          G=3,1,3,3  NSL=1,3
16,21,34         G=1,1,4,3  NSL=1,3
20,1 ,14         G=1,1,2,2  NSL=1,3
22,31,34                    NSL=1,3
23,5,8           G=2,1,2,2  NSL=2,4
26,9,12                     NSL=2,4
27,11,15         G=2,1,3,3  NSL=1,3
30,21,25                    NSL=1,3
31,25,28                    NSL=2,4
32,28,30         G=1,1,2,2  NSL=2,4
34,31,35                    NSL=2,4
35,13,16         G=2,1,3,3  NSL=2,4
33,22,26                    NSL=2,4

COMB1
1 C=1
2 C=1,1
3 C=1.2,1.6
4 C=1.05,0.65
```

PROGRAM:SAP90/FILE:s3-1.F3F
Struktur 3-1

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

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	1-2 PLANE MOMENT	AXIAL FORCE
1					
	1	0.000			-90.288
		0.000	-6.255	6.201	
		3.000	-6.255	-12.565	
		3.000			-83.808
	2	0.000			-24.033
		0.000	-2.387	2.359	
		3.000	-2.387	-4.802	
		3.000			-24.033
	3	0.000			-146.799
		0.000	-11.326	11.216	
		3.000	-11.326	-22.762	
		3.000			-139.023
	4	0.000			-110.424
		0.000	-8.120	8.045	
		3.000	-8.120	-16.315	
		3.000			-103.620
2					
	1	0.000			-248.409
		0.000	0.881	-0.851	
		3.000	0.881	1.792	
		3.000			-241.929
	2	0.000			-74.572
		0.000	0.433	-0.421	
		3.000	0.433	0.877	
		3.000			-74.572
	3	0.000			-417.406
		0.000	1.749	-1.694	
		3.000	1.749	3.553	
		3.000			-409.630
	4	0.000			-309.301
		0.000	1.206	-1.167	
		3.000	1.206	2.451	
		3.000			-302.497
3					
	1	0.000			-248.409
		0.000	-0.881	0.851	
		3.000	-0.881	-1.792	
		3.000			-241.929
	2	0.000			-74.572
		0.000	-0.433	0.421	
		3.000	-0.433	-0.877	
		3.000			-74.572
	3	0.000			-417.406
		0.000	-1.749	1.694	
		3.000	-1.749	-3.553	
		3.000			-409.630
	4	0.000			-309.301
		0.000	-1.206	1.167	
		3.000	-1.206	-2.451	
		3.000			-302.497
4					
	1	0.000			-90.288
		0.000	6.255	-6.201	
		3.000	6.255	12.565	
		3.000			-83.808
	2	0.000			-24.033
		0.000	2.387	-2.359	
		3.000	2.387	4.802	
		3.000			-24.033
	3	0.000			-146.799
		0.000	11.326	-11.216	
		3.000	11.326	22.762	
		3.000			-139.023
	4	0.000			-110.424
		0.000	8.120	-8.045	
		3.000	8.120	16.315	

	3.000			-103.620
5				
1	0.000			-34.979
	0.000	-10.610	16.692	
	3.000	-10.610	-15.139	
	3.000			-28.499
2	0.000			-6.479
	0.000	-3.053	5.417	
	3.000	-3.053	-3.742	
	3.000			-6.479
3	0.000			-52.341
	0.000	-17.617	28.697	
	3.000	-17.617	-24.154	
	3.000			-44.565
4	0.000			-40.940
	0.000	-13.125	21.047	
	3.000	-13.125	-18.328	
	3.000			-34.136
6				
1	0.000			-133.041
	0.000	0.072	-1.035	
	3.000	0.072	-0.819	
	3.000			-126.561
2	0.000			-35.239
	0.000	-0.540	0.067	
	3.000	-0.540	-1.553	
	3.000			-35.239
3	0.000			-216.031
	0.000	-0.777	-1.135	
	3.000	-0.777	-3.467	
	3.000			-208.255
4	0.000			-162.598
	0.000	-0.275	-1.043	
	3.000	-0.275	-1.869	
	3.000			-155.794
7				
1	0.000			-133.041
	0.000	-0.072	1.035	
	3.000	-0.072	0.819	
	3.000			-126.561
2	0.000			-35.239
	0.000	0.540	-0.067	
	3.000	0.540	1.553	
	3.000			-35.239
3	0.000			-216.031
	0.000	0.777	1.135	
	3.000	0.777	3.467	
	3.000			-208.255
4	0.000			-162.598
	0.000	0.275	1.043	
	3.000	0.275	1.869	
	3.000			-155.794
8				
1	0.000			-34.979
	0.000	10.610	-16.692	
	3.000	10.610	15.139	
	3.000			-28.499
2	0.000			-6.479
	0.000	3.053	-5.417	
	3.000	3.053	3.742	
	3.000			-6.479
3	0.000			-52.341
	0.000	17.617	-28.697	
	3.000	17.617	24.154	
	3.000			-44.565
4	0.000			-40.940
	0.000	13.125	-21.047	
	3.000	13.125	18.328	
	3.000			-34.136
9				
1	0.000			-38.482
	0.000	-8.273	9.038	
	3.000	-8.273	-15.781	
	3.000			-32.002

2	0.000			-7.585
	0.000	-2.527	3.512	
	3.000	-2.527	-4.067	
	3.000			-7.585
3	0.000			-58.315
	0.000	-13.970	16.466	
	3.000	-13.970	-25.444	
	3.000			-50.539
4	0.000			-45.337
	0.000	-10.329	11.773	
	3.000	-10.329	-19.213	
	3.000			-38.533

10 ----------

1	0.000			-38.482
	0.000	8.273	-9.038	
	3.000	8.273	15.781	
	3.000			-32.002
2	0.000			-7.585
	0.000	2.527	-3.512	
	3.000	2.527	4.067	
	3.000			-7.585
3	0.000			-58.315
	0.000	13.970	-16.466	
	3.000	13.970	25.444	
	3.000			-50.539
4	0.000			-45.337
	0.000	10.329	-11.773	
	3.000	10.329	19.213	
	3.000			-38.533

11 ----------

1	0.000			4.355
	0.000	48.829	-29.257	
	1.250	22.543	15.350	
	1.250			4.355
2	0.000			0.665
	0.000	17.554	-10.219	
	1.250	8.073	5.798	
	1.250			0.665
3	0.000			6.291
	0.000	86.681	-51.459	
	1.250	39.968	27.697	
	1.250			6.291
4	0.000			5.005
	0.000	62.681	-37.362	
	1.250	28.917	19.886	
	1.250			5.005

12 ----------

1	0.000			4.355
	0.000	22.543	15.350	
	1.072	0.000	27.433	
	1.250	-3.743	27.100	
	1.250			4.355
2	0.000			0.665
	0.000	8.073	5.798	
	1.064	0.000	10.094	
	1.250	-1.409	9.963	
	1.250			0.665
3	0.000			6.291
	0.000	39.968	27.697	
	1.069	0.000	49.069	
	1.250	-6.746	48.460	
	1.250			6.291
4	0.000			5.005
	0.000	28.917	19.886	
	1.071	0.000	35.365	
	1.250	-4.846	34.930	
	1.250			5.005

13 ----------

1	0.000			4.355
	0.000	-3.743	27.100	
	1.250	-30.030	5.991	
	1.250			4.355
2	0.000			0.665
	0.000	-1.409	9.963	

	1.250	-10.890	2.276	
	1.250			0.665
3	0.000			6.291
	0.000	-6.746	48.460	
	1.250	-53.459	10.832	
	1.250			6.291
4	0.000			5.005
	0.000	-4.846	34.930	
	1.250	-38.610	7.771	
	1.250			5.005

14 ----------

1	0.000			4.355
	0.000	-30.030	5.991	
	1.250	-56.316	-47.975	
	1.250			4.355
2	0.000			0.665
	0.000	-10.890	2.276	
	1.250	-20.371	-17.262	
	1.250			0.665
3	0.000			6.291
	0.000	-53.459	10.832	
	1.250	-100.173	-85.188	
	1.250			6.291
4	0.000			5.005
	0.000	-38.610	7.771	
	1.250	-72.373	-61.593	
	1.250			5.005

15 ----------

1	0.000			5.164
	0.000	52.572	-45.148	
	1.250	26.286	4.138	
	1.250			5.164
2	0.000			1.638
	0.000	18.962	-16.451	
	1.250	9.481	1.326	
	1.250			1.638
3	0.000			8.817
	0.000	93.427	-80.500	
	1.250	46.713	7.088	
	1.250			8.817
4	0.000			6.487
	0.000	67.527	-58.099	
	1.250	33.763	5.207	
	1.250			6.487

16 ----------

1	0.000			5.164
	0.000	26.286	4.138	
	1.250	0.000	20.567	
	1.250			5.164
2	0.000			1.638
	0.000	9.481	1.326	
	1.250	0.000	7.252	
	1.250			1.638
3	0.000			8.817
	0.000	46.714	7.088	
	1.250	0.000	36.284	
	1.250			8.817
4	0.000			6.487
	0.000	33.763	5.207	
	1.250	0.000	26.310	
	1.250			6.487

17 ----------

1	0.000			5.164
	0.000	0.000	20.567	
	1.250	-26.286	4.138	
	1.250			5.164
2	0.000			1.638
	0.000	0.000	7.252	
	1.250	-9.481	1.326	
	1.250			1.638
3	0.000			8.817
	0.000	0.000	36.284	
	1.250	-46.714	7.088	

	1.250			8.817
4	0.000			6.487
	0.000	0.000	26.310	
	1.250	-33.763	5.207	
	1.250			6.487
18				
1	0.000			5.164
	0.000	-26.286	4.138	
	1.250	-52.572	-45.148	
	1.250			5.164
2	0.000			1.638
	0.000	-9.481	1.326	
	1.250	-18.962	-16.451	
	1.250			1.638
3	0.000			8.817
	0.000	-46.713	7.088	
	1.250	-93.427	-80.500	
	1.250			8.817
4	0.000			6.487
	0.000	-33.763	5.207	
	1.250	-67.527	-58.099	
	1.250			6.487
19				
1	0.000			4.355
	0.000	56.316	-47.975	
	1.250	30.030	5.991	
	1.250			4.355
2	0.000			0.665
	0.000	20.371	-17.262	
	1.250	10.890	2.276	
	1.250			0.665
3	0.000			6.291
	0.000	100.173	-85.188	
	1.250	53.459	10.832	
	1.250			6.291
4	0.000			5.005
	0.000	72.373	-61.593	
	1.250	38.610	7.771	
	1.250			5.005
20				
1	0.000			4.355
	0.000	30.030	5.991	
	1.250	3.743	27.100	
	1.250			4.355
2	0.000			0.665
	0.000	10.890	2.276	
	1.250	1.409	9.963	
	1.250			0.665
3	0.000			6.291
	0.000	53.459	10.832	
	1.250	5.746	48.460	
	1.250			6.291
4	0.000			5.005
	0.000	38.610	7.771	
	1.250	4.846	34.930	
	1.250			5.005
21				
1	0.000			4.355
	0.000	3.743	27.100	
	0.178	0.000	27.433	
	1.250	-22.543	15.350	
	1.250			4.355
2	0.000			0.665
	0.000	1.409	9.963	
	0.186	0.000	10.094	
	1.250	-8.073	5.798	
	1.250			0.665
3	0.000			6.291
	0.000	6.746	48.460	
	0.181	0.000	49.069	
	1.250	-39.968	27.697	
	1.250			6.291
4	0.000			5.005

	0.000	4.846	34.930	
	0.179	0.000	35.365	
	1.250	-28.917	19.886	
	1.250			5.005
22				
1	0.000			4.355
	0.000	-22.543	15.350	
	1.250	-48.829	-29.257	
	1.250			4.355
2	0.000			0.665
	0.000	-8.073	5.798	
	1.250	-17.554	-10.219	
	1.250			0.665
3	0.000			6.291
	0.000	-39.968	27.697	
	1.250	-86.681	-51.459	
	1.250			6.291
4	0.000			5.005
	0.000	-28.917	19.886	
	1.250	-62.681	-37.362	
	1.250			5.005
23				
1	0.000			-10.610
	0.000	28.499	-15.139	
	1.250	12.498	10.484	
	1.250			-10.610
2	0.000			-3.053
	0.000	6.479	-3.742	
	1.250	2.686	1.987	
	1.250			-3.053
3	0.000			-17.617
	0.000	44.565	-24.154	
	1.250	19.296	15.760	
	1.250			-17.617
4	0.000			-13.125
	0.000	34.136	-18.328	
	1.250	14.869	12.300	

	1.250			-13.125
24				
1	0.000			-10.610
	0.000	12.498	10.484	
	0.976	0.000	16.586	
	1.250	-3.503	16.106	
	1.250			-10.610
2	0.000			-3.053
	0.000	2.686	1.987	
	0.885	0.000	3.176	
	1.250	-1.106	2.974	
	1.250			-3.053
3	0.000			-17.617
	0.000	19.296	15.760	
	0.955	0.000	24.969	
	1.250	-5.974	24.086	
	1.250			-17.617
4	0.000			-13.125
	0.000	14.869	12.300	
	0.965	0.000	19.472	
	1.250	-4.397	18.845	
	1.250			-13.125
25				
1	0.000			-10.610
	0.000	-3.503	16.106	
	1.250	-19.504	1.727	
	1.250			-10.610
2	0.000			-3.053
	0.000	-1.106	2.974	
	1.250	-4.899	-0.779	
	1.250			-3.053
3	0.000			-17.617
	0.000	-5.974	24.086	
	1.250	-31.243	0.826	
	1.250			-17.617
4	0.000			-13.125
	0.000	-4.397	18.845	

		1.250	-23.664	1.307
		1.250		13.125
26				
	1	0.000		-10.610
		0.000	-19.504	1.727
		1.250	-35.506	-32.654
		1.250		-10.610
	2	0.000		-3.053
		0.000	-4.899	-0.779
		1.250	-8.691	-9.272
		1.250		-3.053
	3	0.000		17.617
		0.000	-31 243	0.826
		1.250	-56.513	-54.021
		1.250		-17.617
	4	0.000		-13.125
		0.000	-23.664	1.307
		1.250	-42.930	-40.314
		1.250		-13.125
27				
	1	0.000		-2.266
		0.000	52.573	-42.512
		1.250	26.286	6.775
		1.250		-2.266
	2	0.000		-1.066
		0.000	18.963	-14.337
		1.250	9.481	3.440
		1.250		-1.066
	3	0.000		-4.424
		0.000	93.427	-73.954
		1.250	46.714	13.634
		1.250		-4.424
	4	0.000		-3.072
		0.000	67.527	-53.957
		1.250	33.763	9.350
		1.250		-3.072
28				
	1	0.000		2.266
		0.000	26.286	6.775
		1.250	0.000	23.204
		1.250		-2.266
	2	0.000		1.066
		0.000	9.481	3.440
		1.250	0.000	9.366
		1.250		-1.066
	3	0.000		4.424
		0.000	46.713	13.634
		1.250	0.000	42.830
		1.250		4.424
	4	0.000		-3.072
		0.000	33.763	9.350
		1.250	0.000	30.452
		1.250		-3.072
29				
	1	0.000		-2.266
		0.000	0.000	23.204
		1.250	-26.286	6.775
		1.250		-2.266
	2	0.000		-1.066
		0.000	0.000	9.366
		1.250	-9.481	3.440
		1.250		-1.066
	3	0.000		-4.424
		0.000	0.000	42.830
		1.250	-46.714	13.634
		1.250		-4.424
	4	0.000		-3.072
		0.000	0.000	30.452
		1.250	-33.763	9.350
		1.250		-3.072
30				
	1	0.000		-2.266
		0.000	-26.286	6.775
		1.250	-52.573	-42.512

	1.250			-2.266
2	0.000			-1.066
	0.000	-9.481	3.440	
	1.250	-18.963	-14.337	
	1.250			-1.066
3	0.000			-4.424
	0.000	-46.714	13.634	
	1.250	-93.427	-73.954	
	1.250			-4.424
4	0.000			-3.072
	0.000	-33.763	9.350	
	1.250	-67.527	-53.957	
	1.250			-3.072

31 ----------

1	0.000			-10.610
	0.000	35.506	-32.654	
	1.250	19.504	1.727	
	1.250			-10.610
2	0.000			-3.053
	0.000	8.691	-9.272	
	1.250	4.899	-0.779	
	1.250			-3.053
3	0.000			-17.617
	0.000	56.513	-54.021	
	1.250	31.243	0.826	
	1.250			-17.617
4	0.000			-13.125
	0.000	42.930	-40.314	
	1.250	23.664	1.307	
	1.250			-13.125

32 ----------

1	0.000			-10.610
	0.000	19.504	1.727	
	1.250	3.503	16.106	
	1.250			-10.610
2	0.000			-3.053
	0.000	4.899	0.779	
	1.250	1.106	2.974	
	1.250			-3.053
3	0.000			-17.617
	0.000	31.243	0.826	
	1.250	5.974	24.086	
	1.250			-17.617
4	0.000			-13.125
	0.000	23.664	1.307	
	1.250	4.397	18.845	
	1.250			-13.125

33 ----------

1	0.000			-10.610
	0.000	3.503	16.106	
	0.274	0.000	16.586	
	1.250	-12.498	10.484	
	1.250			-10.610
2	0.000			-3.053
	0.000	1.106	2.974	
	0.365	0.000	3.176	
	1.250	-2.686	1.987	
	1.250			-3.053
3	0.000			-17.617
	0.000	5.974	24.086	
	0.295	0.000	24.969	
	1.250	-19.296	15.760	
	1.250			-17.617
4	0.000			-13.125
	0.000	4.397	18.845	
	0.285	0.000	19.472	
	1.250	-14.869	12.300	
	1.250			-13.125

34 ---

1	0.000			-10.610
	0.000	-12.498	10.484	
	1.250	-28.499	-15.139	
	1.250			-10.610

	2	0.000		-3.053
		0.000	-2.686	1.987
		1.250	-6.479	-3.742
		1.250		-3.053
	3	0.000		-17.617
		0.000	-19.296	15.760
		1.250	-44.565	-24.154
		1.250		-17.617
	4	0.000		-13.125
		0.000	-14.869	12.300
		1.250	-34.136	-18.328
		1.250		-13.125
35				
	1	0.000		-8.273
		0.000	32.003	-15.781
		1.250	16.001	14.222
		1.250		-8.273
	2	0.000		-2.527
		0.000	7.585	-4.067
		1.250	3.792	3.044
		1.250		-2.527
	3	0.000		-13.970
		0.000	50.539	-25.444
		1.250	25.269	21.936
		1.250		-13.970
	4	0.000		-10.329
		0.000	38.533	-19.213
		1.250	19.266	16.911
		1.250		-10.329
36				
	1	0.000		-8.273
		0.000	16.001	14.222
		1.250	0.000	24.222
		1.250		-8.273
	2	0.000		-2.527
		0.000	3.792	3.044
		1.250	0.000	5.414
		1.250		-2.527
	3	0.000		-13.970
		0.000	25.269	21.936
		1.250	0.000	37.729
		1.250		-13.970
	4	0.000		-10.329
		0.000	19.266	16.911
		1.250	0.000	28.953
		1.250		-10.329
37				
	1	0.000		-8.273
		0.000	0.000	24.222
		1.250	-16.001	14.222
		1.250		-8.273
	2	0.000		-2.527
		0.000	0.000	5.414
		1.250	-3.792	3.044
		1.250		-2.527
	3	0.000		-13.970
		0.000	0.000	37.729
		1.250	-25.269	21.936
		1.250		-13.970
	4	0.000		-10.329
		0.000	0.000	28.953
		1.250	-19.266	16.911
		1.250		-10.329
38				
	1	0.000		-8.273
		0.000	-16.001	14.222
		1.250	-32.002	-15.781
		1.250		-8.273
	2	0.000		-2.527
		0.000	-3.792	3.044
		1.250	-7.585	-4.067
		1.250		-2.527
	3	0.000		-13.970

	0.000	-25.269	21.936	
	1.250	-50.539	-25.444	
	1.250			-13.970
4	0.000			-10.329
	0.000	-19.266	16.911	
	1.250	-38.533	-19.213	
	1.250			-10.329

Serviens in lumine veritatis

Lampiran 21. Input analisis S3-2 dengan SAP 90

```
Struktur 3-2

SYSTEM
L=2

JOINTS
1   x=0      y=0     z=0       : bidang koordinat X-Y
3   x=0      y=6           g=1,3,1
4   x=1.25   y=3
5   x=1.25   y=6
8   x=3.75   y=3           g=4,8,2
9   x=3.75   y=6           g=5,9,2
10  x=5      y=0
13  x=5      y=9           g=10,13,1
14  x=6.25   y=3
16  x=6.25   y=9           g=14,16,1
17  x=7.5    y=3
19  x=7.5    y=9           g=17,19,1
20  x=8.75   y=3
22  x=8.75   y=9           g=20,22,1
23  x=10     y=0
26  x=10     y=9           g=23,26,1
27  x=11.25  y=3
31  x=13.75  y=3           g=27,31,2
28  x=11.25  y=6
32  x=13.75  y=6           g=28,32,2
33  x=15     y=0
35  x=15     y=6           g=33,35,1

RESTRAINTS
1,35,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
10      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
23      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
33      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y

FRAME
NM=10   NL=4      Y=-1,0
C PROPERTIES POTONGAN
1  A=0.041109 I=0.000522863183 E=2.35E7        : MATERIAL BALOK
2  A=0.039965 I=0.000519425581
3  A=0.058321 I=0.000876466860
4  A=0.030425 I=0.000305041528
5  A=0.034903 I=0.000417296577
6  A=0.029063 I=0.000304340944
7  A=0.041983 I=0.000558686711
8  A=0.053119 I=0.000771788799
9  A=0.037842 I=0.000476910322
10 A=0.042229 I=0.000259964842 W=2.16 E=2.35E7 : MATERIAL KOLOM
C BEBAN MATI
```

```
1  WG=0,-21.029,0
2  WG=0,-12.801,0
C BEBAN HIDUP
3  WG=0,-7.585,0
4  WG=0,-3.034,0
C KOLOM
1,1,2      M=10  G=1,4,1,1  LP=1,0
2,10,11    M=10  G=1,4,1,1
3,23,24    M=10  G=1,4,1,1
4,33,34    M=10  G=1,4,1,1
9,12,13    M=10  G=1,1,13,13
C BALOK
11,2,4     M=1   G=1,11,29,30 NSL=1,3
12,4,6     M=2   G=1,1,2,2    NSL=1,3
14,8,11    M=3   G=1,5,16,16  NSL=1,3
15,11,14   M=3   G=1,3,9,10   NSL=1,3
16,14,17   M=5   G=1,1,3,3    NSL=1,3
20,27,29   M=2   G=1,1,2,2    NSL=1,3
23,3,5     M=6   G=2,1,2,2    NSL=2,4
26,9,12    M=7   G=1,5,16,16  NSL=2,4
27,12,15   M=8   G=1,3,9,10   NSL=1,3
28,15,18   M=9   G=1,1,3,3    NSL=1,3
32,28,30   M=6   G=1,1,2,2    NSL=2,4
34,32,35   M=6                NSL=2,4
35,13,16   M=4   G=1,3,9,10   NSL=2,4
36,16,19   M=5   G=1,1,3,3    NSL=2,4

COMBO
1 C=1
2 C=0,1
3 C=1.2,1.6
4 C=1.05,0.65
```

PROGRAM:SAP90/FILE:s3-2.F3F
Struktur 3-2

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

ELT ID	LOAD COMB	DIST ENDI	1-2 PLANE SHEAR	MOMENT	AXIAL FORCE
1					
	1	0.000			-88.188
		0.000	-6.009	6.063	
		3.000	-6.009	-11.965	
		3.000			-81.708
	2	0.000			-23.350
		0.000	-2.354	2.365	
		3.000	-2.354	-4.697	
		3.000			-23.350
	3	0.000			-143.186
		0.000	-10.978	11.060	
		3.000	-10.978	-21.873	
		3.000			-135.410
	4	0.000			-107.775
		0.000	-7.840	7.904	
		3.000	-7.840	-15.616	
		3.000			-100.971
2					
	1	0.000			-250.510
		0.000	1.284	-1.265	
		3.000	1.284	2.588	
		3.000			-244.030
	2	0.000			-75.255
		0.000	0.616	-0.610	
		3.000	0.616	1.238	
		3.000			-75.255
	3	0.000			-421.019
		0.000	2.527	-2.493	
		3.000	2.527	5.087	
		3.000			-413.243
	4	0.000			-311.951
		0.000	1.749	-1.724	
		3.000	1.749	3.522	
		3.000			-305.147
3					
	1	0.000			-250.510
		0.000	-1.284	1.265	
		3.000	-1.284	-2.588	
		3.000			-244.030
	2	0.000			-75.255
		0.000	-0.616	0.610	
		3.000	-0.616	-1.238	
		3.000			-75.255
	3	0.000			-421.019
		0.000	-2.527	2.493	
		3.000	-2.527	-5.087	
		3.000			-413.243
	4	0.000			-311.951
		0.000	-1.749	1.724	
		3.000	-1.749	-3.522	
		3.000			-305.147
4					
	1	0.000			-88.188
		0.000	6.009	-6.063	
		3.000	6.009	11.965	
		3.000			-81.708
	2	0.000			-23.350
		0.000	2.354	-2.365	
		3.000	2.354	4.697	
		3.000			-23.350
	3	0.000			-143.186
		0.000	10.978	-11.060	
		3.000	10.978	21.873	
		3.000			-135.410
	4	0.000			-107.775
		0.000	7.840	-7.904	
		3.000	7.840	15.616	

	3.000			-100.971
5	----------			
1	0.000			-34.363
	0.000	-11.198	16.939	
	3.000	-11.198	-16.655	
	3.000			-27.883
2	0.000			-6.323
	0.000	-3.087	5.377	
	3.000	-3.087	-3.883	
	3.000			-6.323
3	0.000			-51.352
	0.000	-18.376	28.930	
	3.000	-18.376	-26.198	
	3.000			-43.576
4	0.000			-40.191
	0.000	-13.764	21.281	
	3.000	-13.764	-20.011	
	3.000			-33.387
6	----------			
1	0.000			-133.657
	0.000	0.776	-2.123	
	3.000	0.776	0.204	
	3.000			-127.177
2	0.000			-35.394
	0.000	-0.467	-0.170	
	3.000	-0.467	-1.570	
	3.000			-35.394
3	0.000			-217.020
	0.000	0.184	-2.820	
	3.000	0.184	-2.267	
	3.000			-209.244
4	0.000			-163.347
	0.000	0.511	-2.340	
	3.000	0.511	-0.806	
	3.000			-156.543
7	----------			
1	0.000			-133.657
	0.000	-0.776	2.123	
	3.000	-0.776	-0.204	
	3.000			-127.177
2	0.000			-35.394
	0.000	0.467	0.170	
	3.000	0.467	1.570	
	3.000			-35.394
3	0.000			-217.020
	0.000	-0.184	2.820	
	3.000	-0.184	2.267	
	3.000			-209.244
4	0.000			-163.347
	0.000	-0.511	2.340	
	3.000	-0.511	0.806	
	3.000			-156.543
8	----------			
1	0.000			-34.363
	0.000	11.198	-16.939	
	3.000	11.198	16.655	
	3.000			-27.883
2	0.000			-6.323
	0.000	3.087	-5.377	
	3.000	3.087	3.883	
	3.000			-6.323
3	0.000			-51.352
	0.000	18.376	-28.930	
	3.000	18.376	26.198	
	3.000			-43.576
4	0.000			-40.191
	0.000	13.764	-21.281	
	3.000	13.764	20.011	
	3.000			-33.387
9	----------			
1	0.000			-38.482
	0.000	-9.274	9.831	
	3.000	-9.274	-17.992	
	3.000			-32.002

```
     2   0.000                          -7.585
         0.000      -2.823       3.925
         3.000      -2.823      -4.544
         3.000                          -7.585

     3   0.000                         -58.315
         0.000     -15.646      18.077
         3.000     -15.646     -28.860
         3.000                         -50.539

     4   0.000                         -45.337
         0.000     -11.573      12.874
         3.000     -11.573     -21.845
         3.000                         -38.533
10 ----------------------------------------
     1   0.000                         -38.482
         0.000       9.274      -9.831
         3.000       9.274      17.992
         3.000                         -32.002

     2   0.000                          -7.585
         0.000       2.823      -3.925
         3.000       2.823       4.544
         3.000                          -7.585

     3   0.000                         -58.315
         0.000      15.646     -18.077
         3.000      15.646      28.860
         3.000                         -50.539

     4   0.000                         -45.337
         0.000      11.573     -12.874
         3.000      11.573      21.845
         3.000                         -38.533
11 ----------------------------------------
     1   0.000                           5.189
         0.000      47.345     -28.904
         1.250      21.059      13.849
         1.250                           5.189

     2   0.000                           0.732
         0.000      17.027     -10.074
         1.250       7.546       5.284
```

```
         1.250                           0.732

     3   0.000                           7.398
         0.000      84.058     -50.803
         1.250      37.345      25.074
         1.250                           7.398

     4   0.000                           5.924
         0.000      60.780     -36.897
         1.250      27.017      17.976
         1.250                           5.924
12 ----------------------------------------
     1   0.000                           5.189
         0.000      21.059      13.849
         1.001       0.000      24.394
         1.250      -5.227      23.744
         1.250                           5.189

     2   0.000                           0.732
         0.000       7.546       5.284
         0.995       0.000       9.038
         1.250      -1.935       8.791
         1.250                           0.732

     3   0.000                           7.398
         0.000      37.345      25.074
         0.999       0.000      43.733
         1.250      -9.369      42.558
         1.250                           7.398

     4   0.000                           5.924
         0.000      27.017      17.976
         1.000       0.000      31.488
         1.250      -6.746      30.645
         1.250                           5.924
13 ----------------------------------------
     1   0.000                           5.189
         0.000      -5.227      23.744
         1.250     -31.513       0.781
         1.250                           5.189

     2   0.000                           0.732
         0.000      -1.935       8.791
```

	1.250	-11.416	0.446	
	1.250			0.732
3	0.000			7.398
	0.000	-9.369	42.558	
	1.250	-56.082	1.651	
	1.250			7.398
4	0.000			5.924
	0.000	-6.746	30.645	
	1.250	-40.510	1.110	
	1.250			5.924

14 ----------

1	0.000			5.189
	0.000	-31.513	0.781	
	1.250	-57.800	-55.039	
	1.250			5.189
2	0.000			0.732
	0.000	-11.416	0.446	
	1.250	-20.898	-19.750	
	1.250			0.732
3	0.000			7.398
	0.000	-56.082	1.651	
	1.250	-102.796	-97.648	
	1.250			7.398
4	0.000			5.924
	0.000	-40.510	1.110	
	1.250	-74.273	-70.629	
	1.250			5.924

15 ----------

1	0.000			5.697
	0.000	52.572	-50.328	
	1.250	26.286	-1.042	
	1.250			5.697
2	0.000			1.815
	0.000	18.962	-18.342	
	1.250	9.481	-0.564	
	1.250			1.815
3	0.000			9.741
	0.000	93.427	-89.741	
	1.250	46.713	-2.153	
	1.250			9.741
4	0.000			7.162
	0.000	67.527	-64.767	
	1.250	33.763	-1.461	
	1.250			7.162

16 ----------

1	0.000			5.697
	0.000	26.286	-1.042	
	1.250	0.000	15.387	
	1.250			5.697
2	0.000			1.815
	0.000	9.481	-0.564	
	1.250	0.000	5.361	
	1.250			1.815
3	0.000			9.741
	0.000	46.713	-2.153	
	1.250	0.000	27.043	
	1.250			9.741
4	0.000			7.162
	0.000	33.763	-1.461	
	1.250	0.000	19.642	
	1.250			7.162

17 ----------

1	0.000			5.697
	0.000	0.000	15.387	
	1.250	-26.286	-1.042	
	1.250			5.697
2	0.000			1.815
	0.000	0.000	5.361	
	1.250	-9.481	-0.564	
	1.250			1.815
3	0.000			9.741
	0.000	0.000	27.043	
	1.250	-46.714	-2.153	

	0.000	-25.270	18.520	
	1.250	-50.539	-28.860	
	1.250			-15.646
4	0.000			-11.573
	0.000	-19.266	14.280	
	1.250	-38.533	-21.845	
	1.250			-11.573

Serviens in lumine veritatis

Lampiran 23. Input analisis S3-3 dengan SAP 90

```
Struktur 3-3

SYSTEM
L=2

JOINTS
1   x=0      y=0     z=0       : bidang koordinat X-Y
3   x=0      y=6           g=1,3,1
4   x=1.25   y=3
5   x=1.25   y=6
8   x=3.75   y=3           g=4,8,2
9   x=3.75   y=6           g=5,9,2
10  x=5      y=0
13  x=5      y=9           g=10,13,1
14  x=6.25   y=3
16  x=6.25   y=9           g=14,16,1
17  x=7.5    y=3
19  x=7.5    y=9           g=17,19,1
20  x=8.75   y=3
22  x=8.75   y=9           g=20,22,1
23  x=10     y=0
26  x=10     y=9           g=23,26,1
27  x=11.25  y=3
31  x=13.75  y=3           g=27,31,2
28  x=11.25  y=6
32  x=13.75  y=6           g=28,32,2
33  x=15     y=0
35  x=15     y=6           g=33,35,1

RESTRAINTS
1,35,1  R=0,0,1,1,1,0
1       R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
10      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
23      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y
33      R=1,1,1,1,1,1  : DUKUNGAN JEPIT SUMBU X-Y

FRAME
NM=12   NL=4      Y=-1,0
C PROPERTIES POTONGAN
1  A=0.041109 I=0.000522863183 E=2.35E7        : MATERIAL BALOK
2  A=0.033907 I=0.000386498015
3  A=0.058321 I=0.000876466860
4  A=0.033218 I=0.000385524144
5  A=0.034903 I=0.000417296577
6  A=0.029063 I=0.000304340944
7  A=0.048121 I=0.000681670695
8  A=0.053119 I=0.000771788799
9  A=0.037842 I=0.000476910322
10 A=0.026151 I=0.000251437242
11 A=0.042229 I=0.000259964842 W=2.16 E=2.35E7 : MATERIAL KOLOM
C BEBAN MATI
1  WG=0,-21.029,0
2  WG=0,-12.801,0
C BEBAN HIDUP
3  WG=0,-7.585,0
4  WG=0,-3.034,0
```

```
C KOLOM
1,1,2      M=11   G=1,4,1,1   LP=1,0
2,10,11    M=11   G=1,4,1,1
3,23,24    M=11   G=1,4,1,1
4,33,34    M=11   G=1,4,1,1
9,12,13    M=11   G=1,1,13,13
C BALOK
11,2,4     M=1    G=1,11,29,30 NSL=1,3
12,4,6     M=9    G=1,1,2,2    NSL=1,3
14,8,11    M=3    G=1,5,16,16  NSL=1,3
15,11,14   M=3    G=1,3,9,10   NSL=1,3
16,14,17   M=5    G=1,1,3,3    NSL=1,3
20,27,29   M=9    G=1,1,2,2    NSL=1,3
23,3,5     M=6    G=1,11,29,30 NSL=2,4
24,5,7     M=10   G=1,1,2,2    NSL=2,4
26,9,12    M=7    G=1,5,16,16  NSL=2,4
27,12,15   M=8    G=1,3,9,10   NSL=1,3
28,15,18   M=5    G=1,1,3,3    NSL=1,3
32,28,30   M=10   G=1,1,2,2    NSL=2,4
35,13,16   M=2    G=1,3,9,10   NSL=2,4
36,16,19   M=4    G=1,1,3,3    NSL=2,4

COMBO
1 C=1
2 C=0,1
3 C=1.2,1.6
4 C=1.05,0.65
```

```
PROGRAM:SAP90/FILE:s3-3.F3F
 Struktur 3-3
 F R A M E   E L E M E N T   F O R C E S
  ELT LOAD    DIST          1-2 PLANE       AXIAL
   ID COMB    ENDI       SHEAR     MOMENT   FORCE
    1 ---------------------------------------------
        1   0.000                           -87.667
            0.000      -6.111       6.165
            3.000      -6.111     -12.167
            3.000                           -81.187

        2   0.000                           -23.196
            0.000      -2.403       2.413
            3.000      -2.403      -4.795
            3.000                           -23.196

        3   0.000                           -142.314
            0.000     -11.177      11.260
            3.000     -11.177     -22.272
            3.000                           -134.538

        4   0.000                           -107.127
            0.000      -7.978       8.042
            3.000      -7.978     -15.892
            3.000                           -100.323
    2 ---------------------------------------------
        1   0.000                           -251.031
            0.000       1.258      -1.240
            3.000       1.258       2.534
            3.000                           -244.551

        2   0.000                            -75.409
            0.000       0.619      -0.613
            3.000       0.619       1.243
            3.000                            -75.409

        3   0.000                           -421.891
            0.000       2.500      -2.468
            3.000       2.500       5.031
            3.000                           -414.115

        4   0.000                           -312.598
            0.000                   1.723    -1.700
            3.000                   1.723     3.469
            3.000                           -305.794
    3 ---------------------------------------------
        1   0.000                           -251.031
            0.000                  -1.258     1.240
            3.000                  -1.258    -2.534
            3.000                           -244.551

        2   0.000                            -75.409
            0.000                  -0.619     0.613
            3.000                  -0.619    -1.243
            3.000                            -75.409

        3   0.000                           -421.891
            0.000                  -2.500     2.468
            3.000                  -2.500    -5.031
            3.000                           -414.115

        4   0.000                           -312.598
            0.000                  -1.723     1.700
            3.000                  -1.723    -3.469
            3.000                           -305.794
    4 ---------------------------------------------
        1   0.000                            -87.667
            0.000                   6.111    -6.165
            3.000                   6.111    12.167
            3.000                            -81.187

        2   0.000                            -23.196
            0.000                   2.403    -2.413
            3.000                   2.403     4.795
            3.000                            -23.196

        3   0.000                           -142.314
            0.000                  11.177   -11.260
            3.000                  11.177    22.272
            3.000                           -134.538

        4   0.000                           -107.127
            0.000                   7.978    -8.042
            3.000                   7.978    15.892
```

	3.000			-100.323
5				
1	0.000			-33.971
	0.000	-11.423	17.258	
	3.000	-11.423	-17.012	
	3.000			-27.491
2	0.000			-6.215
	0.000	-3.126	5.464	
	3.000	-3.126	-3.915	
	3.000			-6.215
3	0.000			-50.708
	0.000	-18.710	29.453	
	3.000	-18.710	-26.678	
	3.000			-42.932
4	0.000			-39.709
	0.000	-14.027	21.673	
	3.000	-14.027	-20.407	
	3.000			-32.905
6				
1	0.000			-134.049
	0.000	1.065	-2.381	
	3.000	1.065	0.813	
	3.000			-127.569
2	0.000			-35.503
	0.000	-0.432	-0.207	
	3.000	-0.432	-1.502	
	3.000			-35.503
3	0.000			-217.664
	0.000	0.587	-3.188	
	3.000	0.587	-1.427	
	3.000			-209.888
4	0.000			-163.829
	0.000	0.837	-2.634	
	3.000	0.837	-0.123	
	3.000			-157.025
7				
1	0.000			-134.049
	0.000	-1.065	2.381	
	3.000	-1.065	-0.813	
	3.000			-127.569
2	0.000			-35.503
	0.000	0.432	0.207	
	3.000	0.432	1.502	
	3.000			-35.503
3	0.000			-217.664
	0.000	-0.587	3.188	
	3.000	-0.587	1.427	
	3.000			-209.888
4	0.000			-163.829
	0.000	-0.837	2.634	
	3.000	-0.837	0.123	
	3.000			-157.025
8				
1	0.000			-33.971
	0.000	11.423	-17.258	
	3.000	11.423	17.012	
	3.000			-27.491
2	0.000			-6.215
	0.000	3.126	-5.464	
	3.000	3.126	3.915	
	3.000			-6.215
3	0.000			-50.708
	0.000	18.710	-29.453	
	3.000	18.710	26.678	
	3.000			-42.932
4	0.000			-39.709
	0.000	14.027	-21.673	
	3.000	14.027	20.407	
	3.000			-32.905
9				
1	0.000			-38.482
	0.000	-9.373	9.609	
	3.000	-9.373	-18.509	
	3.000			-32.002

	2	0.000		-7.585
		0.000	-2.883	3.951
		3.000	-2.883	-4.698
		3.000		-7.585
	3	0.000		-58.315
		0.000	-15.860	17.853
		3.000	-15.860	-29.727
		3.000		-50.539
	4	0.000		-45.337
		0.000	-11.715	12.658
		3.000	-11.715	-22.488
		3.000		-38.533
10				
	1	0.000		-38.482
		0.000	9.373	-9.609
		3.000	9.373	18.509
		3.000		-32.002
	2	0.000		-7.585
		0.000	2.883	-3.951
		3.000	2.883	4.698
		3.000		-7.585
	3	0.000		-58.315
		0.000	15.860	-17.853
		3.000	15.860	29.727
		3.000		-50.539
	4	0.000		-45.337
		0.000	11.715	-12.658
		3.000	11.715	22.488
		3.000		-38.533
11				
	1	0.000		5.312
		0.000	47.216	-29.426
		1.250	20.930	13.165
		1.250		5.312
	2	0.000		0.724
		0.000	16.981	-10.259
		1.250	7.500	5.042
		1.250		0.724
	3	0.000		7.533
		0.000	83.829	-51.725
		1.250	37.116	23.866
		1.250		7.533
	4	0.000		6.049
		0.000	60.615	-37.565
		1.250	26.851	17.101
		1.250		6.049
12				
	1	0.000		5.312
		0.000	20.930	13.165
		0.995	0.000	23.581
		1.250	-5.357	22.899
		1.250		5.312
	2	0.000		0.724
		0.000	7.500	5.042
		0.989	0.000	8.750
		1.250	-1.981	8.491
		1.250		0.724
	3	0.000		7.533
		0.000	37.116	23.866
		0.993	0.000	42.297
		1.250	-9.598	41.065
		1.250		7.533
	4	0.000		6.049
		0.000	26.851	17.101
		0.994	0.000	30.447
		1.250	-6.912	29.563
		1.250		6.049
13				
	1	0.000		5.312
		0.000	-5.357	22.899
		1.250	-31.643	-0.226
		1.250		5.312
	2	0.000		0.724
		0.000	-1.981	8.491

	1.250	-11.462	0.089	
	1.250			0.724
3	0.000			7.533
	0.000	-9.598	41.065	
	1.250	-56.311	-0.128	
	1.250			7.533
4	0.000			6.049
	0.000	-6.912	29.563	
	1.250	-40.675	-0.179	
	1.250			6.049

14 ----------

1	0.000			5.312
	0.000	-31.643	-0.226	
	1.250	-57.929	-56.208	
	1.250			5.312
2	0.000			0.724
	0.000	-11.462	0.089	
	1.250	-20.944	-20.165	
	1.250			0.724
3	0.000			7.533
	0.000	-56.311	-0.128	
	1.250	-103.025	-99.713	
	1.250			7.533
4	0.000			6.049
	0.000	-40.675	-0.179	
	1.250	-74.439	-72.126	
	1.250			6.049

15 ----------

1	0.000			5.506
	0.000	52.572	-51.293	
	1.250	26.286	-2.006	
	1.250			5.506
2	0.000			1.774
	0.000	18.962	-18.714	
	1.250	9.481	-0.937	
	1.250			1.774
3	0.000			9.446
	0.000	93.427	-91.494	
	1.250	46.713	-3.907	
	1.250			9.446
4	0.000			6.934
	0.000	67.527	-66.022	
	1.250	33.763	-2.716	
	1.250			6.934

16 ----------

1	0.000			5.506
	0.000	26.286	-2.006	
	1.250	0.000	14.422	
	1.250			5.506
2	0.000			1.774
	0.000	9.481	-0.937	
	1.250	0.000	4.989	
	1.250			1.774
3	0.000			9.446
	0.000	46.713	-3.907	
	1.250	0.000	25.289	
	1.250			9.446
4	0.000			6.934
	0.000	33.763	-2.716	
	1.250	0.000	18.386	
	1.250			6.934

17 ----------

1	0.000			5.506
	0.000	0.000	14.422	
	1.250	-26.286	-2.006	
	1.250			5.506
2	0.000			1.774
	0.000	0.000	4.989	
	1.250	-9.481	-0.937	
	1.250			1.774
3	0.000			9.446
	0.000	0.000	25.289	
	1.250	-46.714	-3.907	

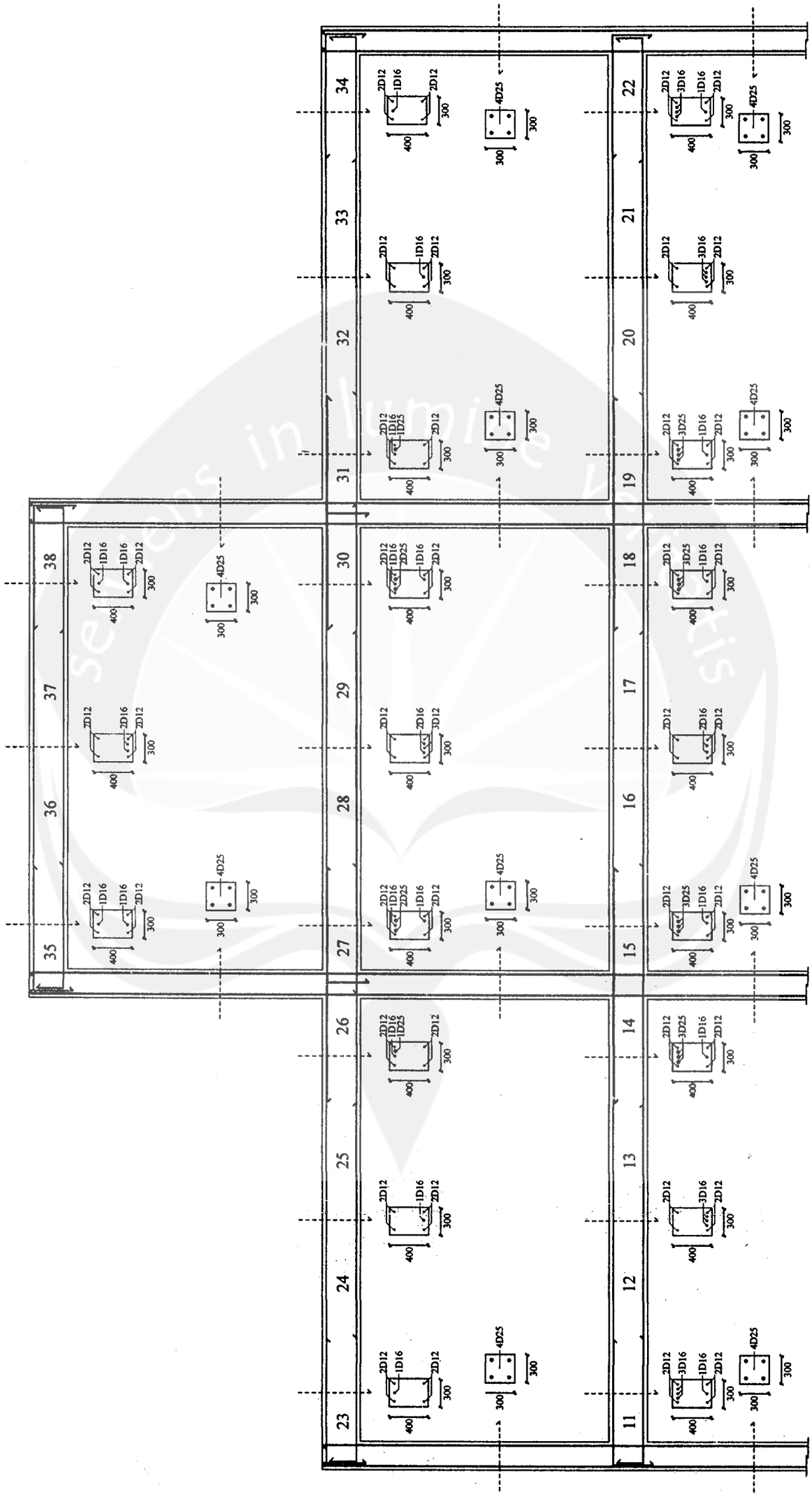
		1.250		9.446
	4	0.000		6.934
		0.000	0.000	18.386
		1.250	-33.763	-2.716
		1.250		6.934
18				
	1	0.000		5.506
		0.000	-26.286	-2.006
		1.250	-52.572	-51.293
		1.250		5.506
	2	0.000		1.774
		0.000	-9.481	-0.937
		1.250	-18.963	-18.714
		1.250		1.774
	3	0.000		9.446
		0.000	-46.714	-3.907
		1.250	-93.427	-91.494
		1.250		9.446
	4	0.000		6.934
		0.000	-33.763	-2.716
		1.250	-67.527	-66.022
		1.250		6.934
19				
	1	0.000		5.312
		0.000	57.929	-56.208
		1.250	31.643	-0.226
		1.250		5.312
	2	0.000		0.724
		0.000	20.944	-20.165
		1.250	11.462	0.089
		1.250		0.724
	3	0.000		7.533
		0.000	103.025	-99.713
		1.250	56.311	-0.128
		1.250		7.533
	4	0.000		6.049
		0.000	74.439	-72.126
		1.250	40.675	-0.179
		1.250		6.049
20				
	1	0.000		5.312
		0.000	31.643	-0.226
		1.250	5.357	22.899
		1.250		5.312
	2	0.000		0.724
		0.000	11.462	0.089
		1.250	1.981	8.491
		1.250		0.724
	3	0.000		7.533
		0.000	56.311	-0.128
		1.250	9.598	41.065
		1.250		7.533
	4	0.000		6.049
		0.000	40.675	-0.179
		1.250	6.912	29.563
		1.250		6.049
21				
	1	0.000		5.312
		0.000	5.357	22.899
		0.255	0.000	23.581
		1.250	-20.930	13.165
		1.250		5.312
	2	0.000		0.724
		0.000	1.981	8.491
		0.261	0.000	8.750
		1.250	-7.500	5.042
		1.250		0.724
	3	0.000		7.533
		0.000	9.598	41.065
		0.257	0.000	42.297
		1.250	-37.116	23.866
		1.250		7.533
	4	0.000		6.049

		0.000	6.912	29.563	
		0.256	0.000	30.447	
		1.250	-26.851	17.101	
		1.250			6.049
22	----------				
	1	0.000			5.312
		0.000	-20.930	13.165	
		1.250	-47.216	-29.426	
		1.250			5.312
	2	0.000			0.724
		0.000	-7.500	5.042	
		1.250	-16.981	-10.259	
		1.250			0.724
	3	0.000			7.533
		0.000	-37.116	23.866	
		1.250	-83.829	-51.725	
		1.250			7.533
	4	0.000			6.049
		0.000	-26.851	17.101	
		1.250	-60.615	-37.565	
		1.250			6.049
23	----------				
	1	0.000			-11.423
		0.000	27.491	-17.012	
		1.250	11.490	7.351	
		1.250			-11.423
	2	0.000			-3.126
		0.000	6.215	-3.915	
		1.250	2.422	1.483	
		1.250			-3.126
	3	0.000			-18.710
		0.000	42.932	-26.678	
		1.250	17.663	11.194	
		1.250			-18.710
	4	0.000			-14.027
		0.000	32.905	-20.407	
		1.250	13.638	8.682	
		1.250			-14.027
24	----------				
	1	0.000			-11.423
		0.000	11.490	7.351	
		0.898	0.000	12.507	
		1.250	-4.512	11.712	
		1.250			-11.423
	2	0.000			-3.126
		0.000	2.422	1.483	
		0.798	0.000	2.450	
		1.250	-1.370	2.140	
		1.250			-3.126
	3	0.000			-18.710
		0.000	17.663	11.194	
		0.874	0.000	18.910	
		1.250	-7.607	17.479	
		1.250			-18.710
	4	0.000			-14.027
		0.000	13.638	8.682	
		0.885	0.000	14.716	
		1.250	-5.628	13.689	
		1.250			-14.027
25	----------				
	1	0.000			-11.423
		0.000	-4.512	11.712	
		1.250	-20.513	-3.928	
		1.250			-11.423
	2	0.000			-3.126
		0.000	-1.370	2.140	
		1.250	-5.163	-1.943	
		1.250			-3.126
	3	0.000			-18.710
		0.000	-7.607	17.479	
		1.250	-32.876	-7.823	
		1.250			-18.710
	4	0.000			-14.027
		0.000	-5.628	13.689	

		1.250	-24.895	-5.388
		1.250		-14.027
26				
	1	0.000		-11.423
		0.000	-20.513	-3.928
		1.250	-36.514	-39.570
		1.250		-11.423
	2	0.000		-3.126
		0.000	-5.163	-1.943
		1.250	-8.955	-10.767
		1.250		-3.126
	3	0.000		-18.710
		0.000	-32.876	-7.823
		1.250	-58.146	-64.712
		1.250		-18.710
	4	0.000		-14.027
		0.000	-24.895	-5.388
		1.250	-44.161	-48.548
		1.250		-14.027
27				
	1	0.000		-0.986
		0.000	52.573	-48.367
		1.250	26.286	0.920
		1.250		-0.986
	2	0.000		-0.675
		0.000	18.963	-16.220
		1.250	9.481	1.557
		1.250		-0.675
	3	0.000		-2.263
		0.000	93.427	-83.992
		1.250	46.714	3.595
		1.250		-2.263
	4	0.000		-1.474
		0.000	67.527	-61.328
		1.250	33.763	1.978
		1.250		-1.474
28				
	1	0.000		-0.986
		0.000	26.286	0.920
		1.250	0.000	17.349
		1.250		-0.986
	2	0.000		-0.675
		0.000	9.481	1.557
		1.250	0.000	7.483
		1.250		-0.675
	3	0.000		-2.263
		0.000	46.714	3.595
		1.250	0.000	32.791
		1.250		-2.263
	4	0.000		-1.474
		0.000	33.763	1.978
		1.250	0.000	23.080
		1.250		-1.474
29				
	1	0.000		-0.986
		0.000	0.000	17.349
		1.250	-26.286	0.920
		1.250		-0.986
	2	0.000		-0.675
		0.000	0.000	7.483
		1.250	-9.481	1.557
		1.250		-0.675
	3	0.000		-2.263
		0.000	0.000	32.791
		1.250	-46.713	3.595
		1.250		-2.263
	4	0.000		-1.474
		0.000	0.000	23.080
		1.250	-33.763	1.978
		1.250		-1.474
30				
	1	0.000		-0.986
		0.000	-26.286	0.920
		1.250	-52.572	-48.367

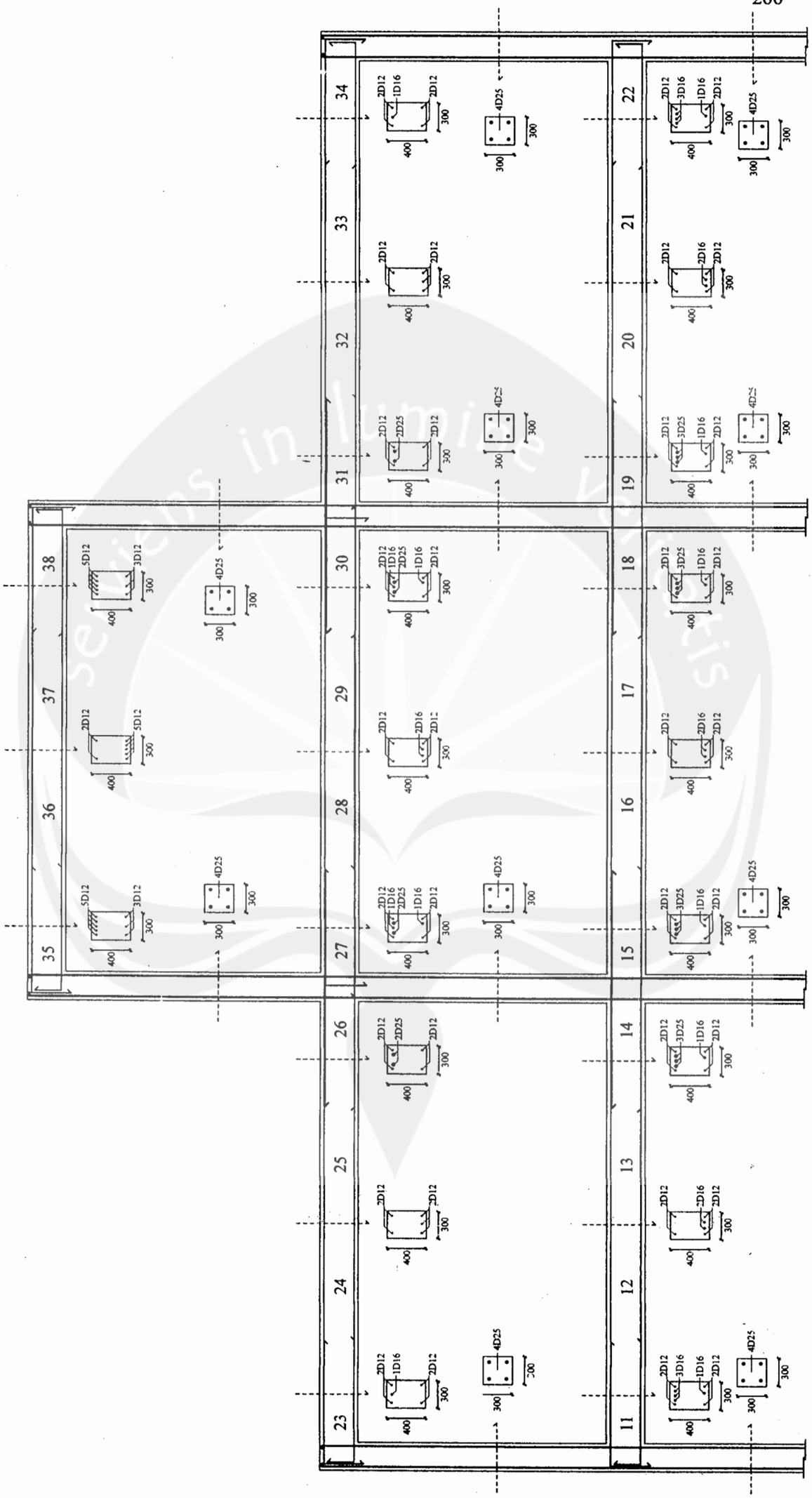
	0.000	-25.270	17.653	
	1.250	-50.539	-29.727	
	1.250			-15.860
4	0.000			-11.715
	0.000	-19.266	13.637	
	1.250	-38.533	-22.488	
	1.250			-11.715

Lampiran 25. Detail penulangan kolom dan balok struktur (S3-1)



Skala 1:50

Lampiran 26. Detail penulangan kolom dan balok struktur (S3-2)



Skala 1:50