BAB IV

PERENCANAAN GELAGAR JEMBATAN

4.1 Desain Gelagar

Untuk mendesain gelagar suatu jembatan maka dibutuhkan data-data sebagai berikut ;

4.1.1 Data gelagar

1. Mutu beton (f'_c) = 45 MPa
2. Kuat tarik ultimit baja prategang (f_{pu}) = 1800 MPa
3. Modulus elastis beton (E_c) = $4700\sqrt{f'_c}$

   $= 4700\sqrt{45}$ = 31.528,56 ≈ 32.000 MPa
4. Modulus elastis baja (E_s) = 2.10^5 Mpa
5. Panjang gelagar total (L) = 280 m (112 segmen)
6. Panjang bentang A – B = 70 m (28 segmen)
7. Panjang bentang B – C = 140 m (56 segmen)
8. Panjang bentang C – D = 70 m (28 segmen)

9. Lebar gelagar (B) = 9 m

10. Jumlah jalur = 2 jalur

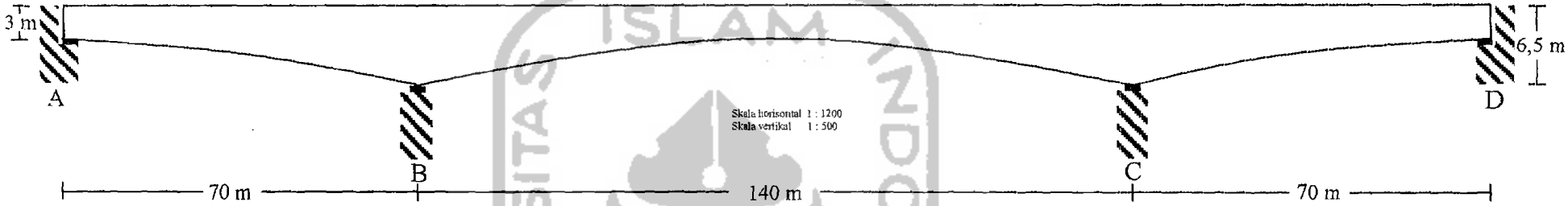
11. Lebar jalan = 7,5 m

12. Lebar tiap segmen = 2,5 m

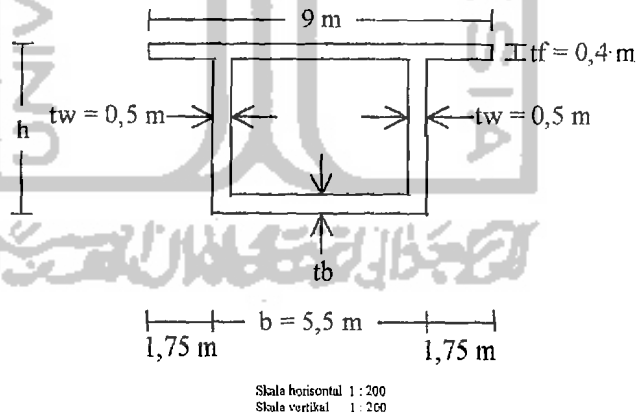
13. Tinggi gelagar sisi pendek (h) = 3 m

14. Tinggi gelagar sisi panjang (h) = 6,5 m

4.1.2 Tampang memanjang dan potongan melintang gelagar tumpuan A – D



Gambar 4.1 Tampang memanjang gelagar tumpuan A – D



Gambar 4.2 Potongan melintang gelagar tumpuan A – D

4.2 Desain Pembebanan

4.2.1 Berat sendiri

Berat sendiri dari gelagar tiap segmen dapat dilihat pada tabel 4.2, dari hasil perhitungan tersebut diambil berat sendiri gelagar rata-rata yaitu 24,624 t/m.

4.2.2 Beban mati

Beban mati terdiri dari ;

1. Perkerasan jalan beraspal	=	7,5 m x 0,08 m x 2 t/m^3	= 1,200 t/m
2. Beban trotoar	=	2 x 1,15 m x 0,2 m x 2,20 t/m^3	= 1,012 t/m
3. Beban tiang-tiang sandaran	=	2 x 0,1 t/m	= 0,2 t/m
		total	= 2 ,412 t/m

4.2.3 Beban hidup

1. Koefisien kejut ;

Mengacu pada formula (3.3), maka nilai $K = 1 + \frac{20}{50 + L}$, sehingga diperoleh nilai K sebagai berikut ;

Bentang A – B, dengan L = 70 m

$$K = 1 + \frac{20}{50 + 70} = 1,1667$$

Bentang B – C, dengan L = 140 m

$$K = 1 + \frac{20}{50 + 140} = 1,1053$$

Bentang C – D, dengan L = 70 m

$$K = 1 + \frac{20}{50 + 70} = 1,1667$$

2. Beban hidup terbagi rata

Mengacu pada tabel 3.2, maka nilai p = 1,1.(1 + 30/ L) t/m x koefisien kejut, sehingga diperoleh nilai p sebagai berikut ;

Bentang A – B, dengan L = 70 m

p = 1,1.(1 + 30/70) t/m x 1,1667

= 1,8334 t/m

Bentang B - C, dengan L = 140 m

p = 1,1.(1 + 30/140) t/m x 1,1053

= 1,4764 t/m

Bentang C – D, dengan L = 70 m

p = 1,1.(1 + 30/70) t/m x 1,1667

= 1,8334 t/m

Untuk lebar jalan 7,5 m (terdiri dari 2 jalur)

$$p' = \frac{5,5}{2,75} p + \frac{2}{2,75} 0,5p$$

$p' = 2\ p + 0,364\ p$

$= 2,364\ p$

Bentang A – B, dengan L = 70 m

$p' = 2,364 \times 1,8334$

$= 4,3342$ t/m

Bentang B – C, dengan L = 140 m

$p' = 2,364 \times 1,4764$

$= 3,4902$ t/m^2

Bentang C – D, dengan L = 70 m

$p' = 2,364 \times 1,8334$

$= 4,3342$ t/m

Beban hidup terbagi rata pada trotoar

$p'' = 2 \times 1,15 \times 0,5 = 1,150$ t/m

Beban hidup terbagi rata total $p_{total} = p' + p''$

Bentang A – B, dengan L = 70 m

$p_{total} = 4,3342 + 1,150$

$= 5,4842$ t/m

Bentang B – C, dengan L = 140 m

$p_{total} = 3,4902 + 1,150$

= 4,6402 t/m

Bentang C – D, dengan L = 70 m

p_{total} = 4,3342 + 1,150

= 5,4842 t/m

3. Beban hidup garis

P = 2,364 x 12 ton x koefisien kejut

Bentang A – B, dengan L = 70 m

P = 2,364 x 12 x 1,1667

= 33,0969 t

Bentang B – C, dengan L = 140 m

P = 2,364 x 12 x 1,1053

= 31,3551 t

Bentang C – D, dengan L = 70 m

P = 2,364 x 12 x 1,1667

= 33,0969 t

4.3 Perhitungan Tinggi Gelagar Tiap Segmen Tumpuan A -- D

4.3.1 Perhitungan jari-jari lingkaran

Mengacu pada formula (3.4), maka nilai $R^2 = (R-3,5)^2 + 70^2$, sehingga diperoleh R sebagai berikut ;

$R^2 = (R-3,5)^2 + 70^2$

$R^2 = R^2 - 7R + 12,25 + 4900$

$7R = 4912,25$

$R = 701,75$ m

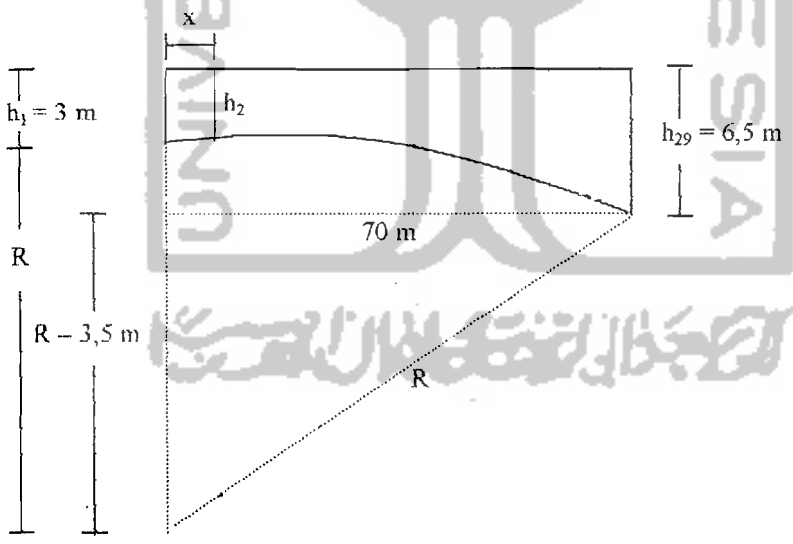
4.3.2 Perhitungan tinggi gelagar

$h_1 = 3$ m

Mengacu pada formula (3.6), maka nilai $h_i = (R+3) - \sqrt{R^2 - x^2}$, sehingga diperoleh h_2 (x = 2,5 m) sebagai berikut ;

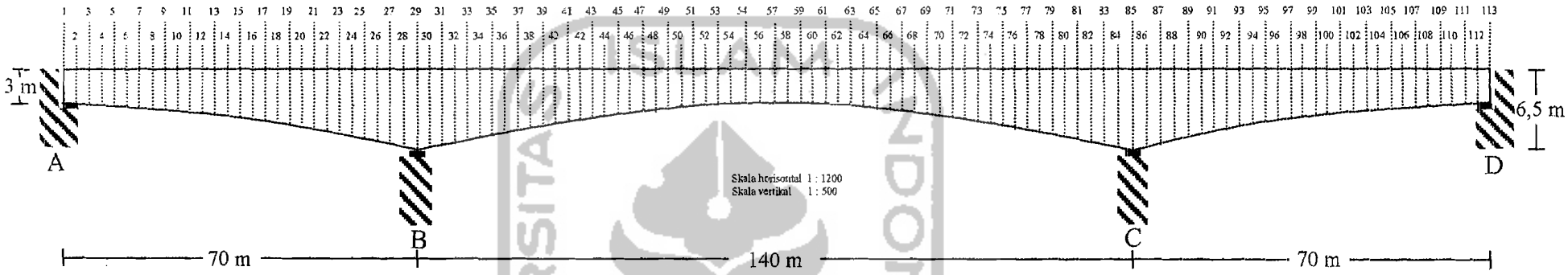
$h_2 = (701,75 + 3) - \sqrt{701,75^2 - 2,5^2} = 3,0045$ m

h_3 dan seterusnya dapat dilihat pada tabel 4.1



Gambar 4.3 Sket mencari tinggi gelagar

4.3.3 Pembagian No nodal gelagar tumpuan A – D



Gambar 4.4 Pembagian No nodal gelagar tumpuan A - D

Tabel 4.1 Tinggi penampang gelagar tiap segmen tumpuan A - D

No nodal	R (m) (jari-jari)	Jarak (X) (m)	Tinggi segmen (h) (m)
1	701.7500	0.0	3.0000
2	701.7500	2.5	3.0045
3	701.7500	5.0	3.0178
4	701.7500	7.5	3.0401
5	701.7500	10.0	3.0713
6	701.7500	12.5	3.1113
7	701.7500	15.0	3.1603
8	701.7500	17.5	3.2182
9	701.7500	20.0	3.2851
10	701.7500	22.5	3.3608
11	701.7500	25.0	3.4455
12	701.7500	27.5	3.5390
13	701.7500	30.0	3.6415
14	701.7500	32.5	3.7530
15	701.7500	35.0	3.8734
16	701.7500	37.5	4.0027
17	701.7500	40.0	4.1409
18	701.7500	42.5	4.2881
19	701.7500	45.0	4.4443
20	701.7500	47.5	4.6094
21	701.7500	50.0	4.7835
22	701.7500	52.5	4.9666
23	701.7500	55.0	5.1586
24	701.7500	57.5	5.3597
25	701.7500	60.0	5.5697
26	701.7500	62.5	5.7888
27	701.7500	65.0	6.0168
28	701.7500	67.5	6.2539
29	701.7500	70.0	6.5000
30	701.7500	72.5	6.2539
31	701.7500	75.0	6.0168
32	701.7500	77.5	5.7888
33	701.7500	80.0	5.5697
34	701.7500	82.5	5.3597
35	701.7500	85.0	5.1586
36	701.7500	87.5	4.9666
37	701.7500	90.0	4.7835
38	701.7500	92.5	4.6094
39	701.7500	95.0	4.4443
40	701.7500	97.5	4.2881

Lanjutan tabel 4.1 Tinggi penampang gelagar tiap segmen tumpuan A - D

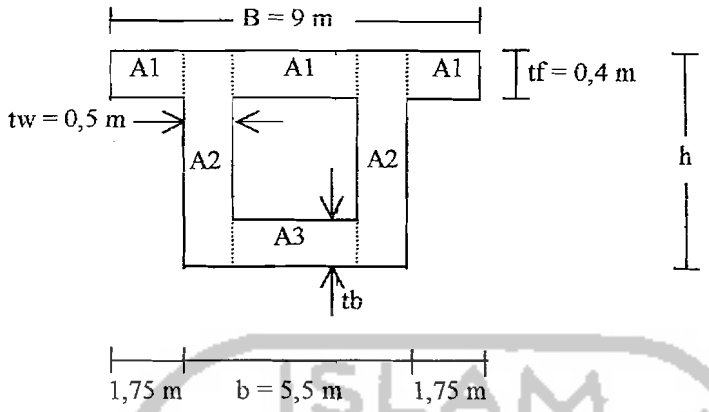
No nodal	R (m) (jari-jari)	Jarak (X) (m)	Tinggi segmen (h) (m)
41	701.7500	100.0	4.1409
42	701.7500	102.5	4.0027
43	701.7500	105.0	3.8734
44	701.7500	107.5	3.7530
45	701.7500	110.0	3.6415
46	701.7500	112.5	3.5390
47	701.7500	115.0	3.4455
48	701.7500	117.5	3.3608
49	701.7500	120.0	3.2851
50	701.7500	122.5	3.2182
51	701.7500	125.0	3.1603
52	701.7500	127.5	3.1113
53	701.7500	130.0	3.0713
54	701.7500	132.5	3.0401
55	701.7500	135.0	3.0178
56	701.7500	137.5	3.0045
57	701.7500	140.0	3.0000
58	701.7500	142.5	3.0045
59	701.7500	145.0	3.0178
60	701.7500	147.5	3.0401
61	701.7500	150.0	3.0713
62	701.7500	152.5	3.1113
63	701.7500	155.0	3.1603
64	701.7500	157.5	3.2182
65	701.7500	160.0	3.2851
66	701.7500	162.5	3.3608
67	701.7500	165.0	3.4455
68	701.7500	167.5	3.5390
69	701.7500	170.0	3.6415
70	701.7500	172.5	3.7530
71	701.7500	175.0	3.8734
72	701.7500	177.5	4.0027
73	701.7500	180.0	4.1409
74	701.7500	182.5	4.2881
75	701.7500	185.0	4.4443
76	701.7500	187.5	4.6094
77	701.7500	190.0	4.7835
78	701.7500	192.5	4.9666
79	701.7500	195.0	5.1586
80	701.7500	197.5	5.3597
81	701.7500	200.0	5.5697

Lanjutan tabel 4.1 Tinggi penampang gelagar tiap segmen tumpuan A - D

No nodal	R (m) (jari-jari)	Jarak (X) (m)	Tinggi segmen (h) (m)
82	701.7500	202.5	5.7888
83	701.7500	205.0	6.0168
84	701.7500	207.5	6.2539
85	701.7500	210.0	6.5000
86	701.7500	212.5	6.2539
87	701.7500	215.0	6.0168
88	701.7500	217.5	5.7888
89	701.7500	220.0	5.5697
90	701.7500	222.5	5.3597
91	701.7500	225.0	5.1586
92	701.7500	227.5	4.9666
93	701.7500	230.0	4.7835
94	701.7500	232.5	4.6094
95	701.7500	235.0	4.4443
96	701.7500	237.5	4.2881
97	701.7500	240.0	4.1409
98	701.7500	242.5	4.0027
99	701.7500	245.0	3.8734
100	701.7500	247.5	3.7530
101	701.7500	250.0	3.6415
102	701.7500	252.5	3.5390
103	701.7500	255.0	3.4455
104	701.7500	257.5	3.3608
105	701.7500	260.0	3.2851
106	701.7500	262.5	3.2182
107	701.7500	265.0	3.1603
108	701.7500	267.5	3.1113
109	701.7500	270.0	3.0713
110	701.7500	272.5	3.0401
111	701.7500	275.0	3.0178
112	701.7500	277.5	3.0045
113	701.7500	280.0	3.0000

4.4 Perhitungan Berat Sendiri Penampang Gelagar Tiap Segmen

Tumpuan A – D



Mengacu pada formula (3.7) sampai (3.11), maka diperoleh ;

Pembagian luasan penampang gelagar No nodal 1 adalah

A1 = (B – 2.tw).tf

= (9 – 2.0,5).0,4

= 3,2000 m^2

A2 = 2.(tw.h)

= 2.(0,5.3)

= 3,0000 m^2

A3 = (b – 2tw).tb

= (5,5 – 2.0,5).0,4

= 1,8000 m^2

A total = A1 + A2 + A3

= 3,2000 + 3,0000 + 1,8000

= 8,0000 m^2

Berat sendiri gelagar No nodal 1 adalah = A total x Bj beton

= 8,0000 x 2,5

= 20,0000 t/m

dimana ;

h = tinggi gelagar

b = lebar sisi bawah gelagar

B = lebar sisi atas gelagar

tf = tebal flens gelagar

tw = tebal badan gelagar

tb = tebal bawah gelagar

A1 = asumsi luas penampang gelagar bagian flens No nodal 1

A2 = asumsi luas penampang gelagar bagian badan No nodal 1

A3 = asumsi luas penampang gelagar bagian bawah No nodal 1

Untuk berat sendiri selanjutnya dapat dilihat pada tabel 4.2

Tabel 4.2 Berat sendiri penampang gelagar tiap segmen tumpuan A - D

No nodal	h (m)	b (m)	b - 2tw (m)	tb (m)	B - 2tw (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	A total (m^2)	Bj beton (t/m^3)	BS (t/m)
1	3.0000	5.5000	4.5000	0.4000	8.0000	3.2000	3.0000	1.8000	8.0000	2.5	20.0000
2	3.0045	5.5000	4.5000	0.4006	8.0000	3.2000	3.0045	1.8027	8.0072	2.5	20.0180
3	3.0178	5.5000	4.5000	0.4024	8.0000	3.2000	3.0178	1.8107	8.0285	2.5	20.0712
4	3.0401	5.5000	4.5000	0.4053	8.0000	3.2000	3.0401	1.8241	8.0642	2.5	20.1604
5	3.0713	5.5000	4.5000	0.4095	8.0000	3.2000	3.0713	1.8428	8.1141	2.5	20.2852
6	3.1113	5.5000	4.5000	0.4148	8.0000	3.2000	3.1113	1.8668	8.1781	2.5	20.4452
7	3.1603	5.5000	4.5000	0.4214	8.0000	3.2000	3.1603	1.8962	8.2565	2.5	20.6412
8	3.2182	5.5000	4.5000	0.4291	8.0000	3.2000	3.2182	1.9309	8.3491	2.5	20.8728
9	3.2851	5.5000	4.5000	0.4380	8.0000	3.2000	3.2851	1.9711	8.4562	2.5	21.1404
10	3.3608	5.5000	4.5000	0.4481	8.0000	3.2000	3.3608	2.0165	8.5773	2.5	21.4432
11	3.4455	5.5000	4.5000	0.4594	8.0000	3.2000	3.4455	2.0673	8.7128	2.5	21.7820
12	3.5390	5.5000	4.5000	0.4719	8.0000	3.2000	3.5390	2.1234	8.8624	2.5	22.1560
13	3.6415	5.5000	4.5000	0.4855	8.0000	3.2000	3.6415	2.1849	9.0264	2.5	22.5660
14	3.7530	5.5000	4.5000	0.5004	8.0000	3.2000	3.7530	2.2518	9.2048	2.5	23.0120
15	3.8734	5.5000	4.5000	0.5165	8.0000	3.2000	3.8734	2.3240	9.3974	2.5	23.4936
16	4.0027	5.5000	4.5000	0.5337	8.0000	3.2000	4.0027	2.4016	9.6043	2.5	24.0108
17	4.1409	5.5000	4.5000	0.5521	8.0000	3.2000	4.1409	2.4845	9.8254	2.5	24.5636
18	4.2881	5.5000	4.5000	0.5717	8.0000	3.2000	4.2881	2.5729	10.0610	2.5	25.1524
19	4.4443	5.5000	4.5000	0.5926	8.0000	3.2000	4.4443	2.6666	10.3109	2.5	25.7772
20	4.6094	5.5000	4.5000	0.6146	8.0000	3.2000	4.6094	2.7656	10.5750	2.5	26.4376
21	4.7835	5.5000	4.5000	0.6378	8.0000	3.2000	4.7835	2.8701	10.8536	2.5	27.1340
22	4.9666	5.5000	4.5000	0.6622	8.0000	3.2000	4.9666	2.9800	11.1466	2.5	27.8664
23	5.1586	5.5000	4.5000	0.6878	8.0000	3.2000	5.1586	3.0952	11.4538	2.5	28.6344
24	5.3597	5.5000	4.5000	0.7146	8 0000	3.2000	5.3597	3.2158	11.7755	2.5	29.4388
25	5.5697	5.5000	4.5000	0.7426	8 0000	3.2000	5.5697	3.3418	12.1115	2.5	30.2788
26	5.7888	5.5000	4.5000	0.7718	8.0000	3.2000	5.7888	3.4733	12.4621	2.5	31.1552
27	6.0168	5.5000	4.5000	0.8022	8.0000	3.2000	6.0168	3.6101	12.8269	2.5	32.0672

Lanjutan tabel 4.2 Berat sendiri penampang gelagar tiap segmen tumpuan A - D

No nodal	h (m)	b (m)	b - 2tw (m)	tb (m)	B - 2tw (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	A total (m^2)	Bj beton (t/m^3)	BS (t/m)
28	6.2539	5.5000	4.5000	0.8339	8.0000	3.2000	6.2539	3.7523	13.2062	2.5	33.0156
29	6.5000	5.5000	4.5000	0.8667	8.0000	3.2000	6.5000	3.9000	13.6000	2.5	34.0000
30	6.2539	5.5000	4.5000	0.8339	8.0000	3.2000	6.2539	3.7523	13.2062	2.5	33.0156
31	6.0168	5.5000	4.5000	0.8022	8.0000	3.2000	6.0168	3.6101	12.8269	2.5	32.0672
32	5.7888	5.5000	4.5000	0.7718	8.0000	3.2000	5.7888	3.4733	12.4621	2.5	31.1552
33	5.5697	5.5000	4.5000	0.7426	8.0000	3.2000	5.5697	3.3418	12.1115	2.5	30.2788
34	5.3597	5.5000	4.5000	0.7146	8.0000	3.2000	5.3597	3.2158	11.7755	2.5	29.4388
35	5.1586	5.5000	4.5000	0.6878	8.0000	3.2000	5.1586	3.0952	11.4538	2.5	28.6344
36	4.9666	5.5000	4.5000	0.6622	8.0000	3.2000	4.9666	2.9800	11.1466	2.5	27.8664
37	4.7835	5.5000	4.5000	0.6378	8.0000	3.2000	4.7835	2.8701	10.8536	2.5	27.1340
38	4.6094	5.5000	4.5000	0.6146	8.0000	3.2000	4.6094	2.7656	10.5750	2.5	26.4376
39	4.4443	5.5000	4.5000	0.5926	8.0000	3.2000	4.4443	2.6666	10.3109	2.5	25.7772
40	4.2881	5.5000	4.5000	0.5717	8.0000	3.2000	4.2881	2.5729	10.0610	2.5	25.1524
41	4.1409	5.5000	4.5000	0.5521	8.0000	3.2000	4.1409	2.4845	9.8254	2.5	24.5636
42	4.0027	5.5000	4.5000	0.5337	8.0000	3.2000	4.0027	2.4016	9.6043	2.5	24.0108
43	3.8734	5.5000	4.5000	0.5165	8.0000	3.2000	3.8734	2.3240	9.3974	2.5	23.4936
44	3.7530	5.5000	4.5000	0.5004	8.0000	3.2000	3.7530	2.2518	9.2048	2.5	23.0120
45	3.6415	5.5000	4.5000	0.4855	8.0000	3.2000	3.6415	2.1849	9.0264	2.5	22.5660
46	3.5390	5.5000	4.5000	0.4719	8.0000	3.2000	3.5390	2.1234	8.8624	2.5	22.1560
47	3.4455	5.5000	4.5000	0.4594	8.0000	3.2000	3.4455	2.0673	8.7128	2.5	21.7820
48	3.3608	5.5000	4.5000	0.4481	8.0000	3.2000	3.3608	2.0165	8.5773	2.5	21.4432
49	3.2851	5.5000	4.5000	0.4380	8.0000	3.2000	3.2851	1.9711	8.4562	2.5	21.1404
50	3.2182	5.5000	4.5000	0.4291	8.0000	3.2000	3.2182	1.9309	8.3491	2.5	20.8728
51	3.1603	5.5000	4.5000	0.4214	8.0000	3.2000	3.1603	1.8962	8.2565	2.5	20.6412
52	3.1113	5.5000	4.5000	0.4148	8.0000	3.2000	3.1113	1.8668	8.1781	2.5	20.4452
53	3.0713	5.5000	4.5000	0.4095	8.0000	3.2000	3.0713	1.8428	8.1141	2.5	20.2852
54	3.0401	5.5000	4.5000	0.4053	8.0000	3.2000	3.0401	1.8241	8.0642	2.5	20.1604

Lanjutan tabel 4.2 Berat sendiri penampang gelagar tiap segmen tumpuan A - D

No nodal	h (m)	b (m)	b - 2tw (m)	tb (m)	B - 2tw (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	A total (m^2)	Bj beton (t/m^3)	BS (t/m)
55	3.0178	5.5000	4.5000	0.4024	8.0000	3.2000	3.0178	1.8107	8.0285	2.5	20.0712
56	3.0045	5.5000	4.5000	0.4006	8.0000	3.2000	3.0045	1.8027	8.0072	2.5	20.0180
57	3.0000	5.5000	4.5000	0.4000	8.0000	3.2000	3.0000	1.8000	8.0000	2.5	20.0000
58	3.0045	5.5000	4.5000	0.4006	8.0000	3.2000	3.0045	1.8027	8.0072	2.5	20.0180
59	3.0178	5.5000	4.5000	0.4024	8.0000	3.2000	3.0178	1.8107	8.0285	2.5	20.0712
60	3.0401	5.5000	4.5000	0.4053	8.0000	3.2000	3.0401	1.8241	8.0642	2.5	20.1604
61	3.0713	5.5000	4.5000	0.4095	8.0000	3.2000	3.0713	1.8428	8.1141	2.5	20.2852
62	3.1113	5.5000	4.5000	0.4148	8.0000	3.2000	3.1113	1.8668	8.1781	2.5	20.4452
63	3.1603	5.5000	4.5000	0.4214	8.0000	3.2000	3.1603	1.8962	8.2565	2.5	20.6412
64	3.2182	5.5000	4.5000	0.4291	8.0000	3.2000	3.2182	1.9309	8.3491	2.5	20.8728
65	3.2851	5.5000	4.5000	0.4380	8.0000	3.2000	3.2851	1.9711	8.4562	2.5	21.1404
66	3.3608	5.5000	4.5000	0.4481	8.0000	3.2000	3.3608	2.0165	8.5773	2.5	21.4432
67	3.4455	5.5000	4.5000	0.4594	8.0000	3.2000	3.4455	2.0673	8.7128	2.5	21.7820
68	3.5390	5.5000	4.5000	0.4719	8.0000	3.2000	3.5390	2.1234	8.8624	2.5	22.1560
69	3.6415	5.5000	4.5000	0.4855	8.0000	3.2000	3.6415	2.1849	9.0264	2.5	22.5660
70	3.7530	5.5000	4.5000	0.5004	8.0000	3.2000	3.7530	2.2518	9.2048	2.5	23.0120
71	3.8734	5.5000	4.5000	0.5165	8.0000	3.2000	3.8734	2.3240	9.3974	2.5	23.4936
72	4.0027	5.5000	4.5000	0.5337	8.0000	3.2000	4.0027	2.4016	9.6043	2.5	24.0108
73	4.1409	5.5000	4.5000	0.5521	8.0000	3.2000	4.1409	2.4845	9.8254	2.5	24.5636
74	4.2881	5.5000	4.5000	0.5717	8.0000	3.2000	4.2881	2.5729	10.0610	2.5	25.1524
75	4.4443	5.5000	4.5000	0.5926	8.0000	3.2000	4.4443	2.6666	10.3109	2.5	25.7772
76	4.6094	5.5000	4.5000	0.6146	8.0000	3.2000	4.6094	2.7656	10.5750	2.5	26.4376
77	4.7835	5.5000	4.5000	0.6378	8.0000	3.2000	4.7835	2.8701	10.8536	2.5	27.1340
78	4.9666	5.5000	4.5000	0.6622	8.0000	3.2000	4.9666	2.9800	11.1466	2.5	27.8664
79	5.1586	5.5000	4.5000	0.6878	8.0000	3.2000	5.1586	3.0952	11.4538	2.5	28.6344
80	5.3597	5.5000	4.5000	0.7146	8.0000	3.2000	5.3597	3.2158	11.7755	2.5	29.4388
81	5.5697	5.5000	4.5000	0.7426	8.0000	3.2000	5.5697	3.3418	12.1115	2.5	30.2788

Lanjutan tabel 4.2 Berat sendiri penampang gelagar tiap segmen tumpuan A - D

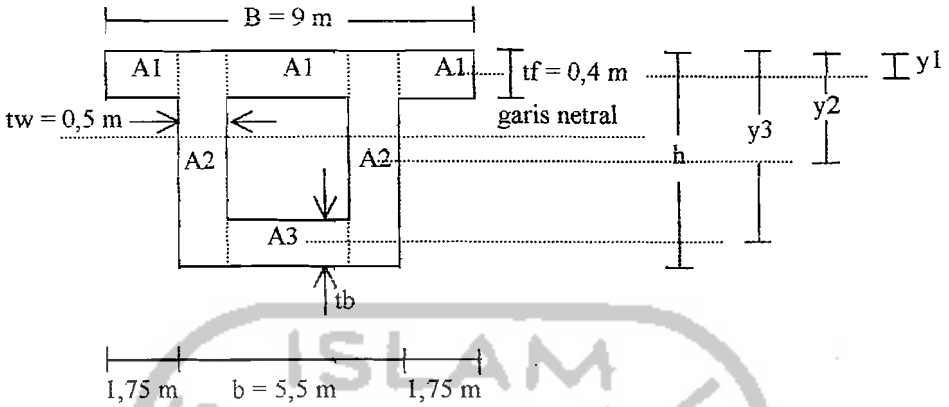
No nodal	h (m)	b (m)	b - 2tw (m)	tb (m)	B - 2tw (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	A total (m^2)	Bj beton (t/m^3)	BS (t/m)
82	5.7888	5.5000	4.5000	0.7718	8.0000	3.2000	5.7888	3.4733	12.4621	2.5	31.1552
83	6.0168	5.5000	4.5000	0.8022	8.0000	3.2000	6.0168	3.6101	12.8269	2.5	32.0672
84	6.2539	5.5000	4.5000	0.8339	8.0000	3.2000	6.2539	3.7523	13.2062	2.5	33.0156
85	6.5000	5.5000	4.5000	0.8667	8.0000	3.2000	6.5000	3.9000	13.6000	2.5	34.0000
86	6.2539	5.5000	4.5000	0.8339	8.0000	3.2000	6.2539	3.7523	13.2062	2.5	33.0156
87	6.0168	5.5000	4.5000	0.8022	8.0000	3.2000	6.0168	3.6101	12.8269	2.5	32.0672
88	5.7888	5.5000	4.5000	0.7718	8.0000	3.2000	5.7888	3.4733	12.4621	2.5	31.1552
89	5.5697	5.5000	4.5000	0.7426	8.0000	3.2000	5.5697	3.3418	12.1115	2.5	30.2788
90	5.3597	5.5000	4.5000	0.7146	8.0000	3.2000	5.3597	3.2158	11.7755	2.5	29.4388
91	5.1586	5.5000	4.5000	0.6878	8.0000	3.2000	5.1586	3.0952	11.4538	2.5	28.6344
92	4.9666	5.5000	4.5000	0.6622	8.0000	3.2000	4.9666	2.9800	11.1466	2.5	27.8664
93	4.7835	5.5000	4.5000	0.6378	8.0000	3.2000	4.7835	2.8701	10.8536	2.5	27.1340
94	4.6094	5.5000	4.5000	0.6146	8.0000	3.2000	4.6094	2.7656	10.5750	2.5	26.4376
95	4.4443	5.5000	4.5000	0.5926	8.0000	3.2000	4.4443	2.6666	10.3109	2.5	25.7772
96	4.2881	5.5000	4.5000	0.5717	8.0000	3.2000	4.2881	2.5729	10.0610	2.5	25.1524
97	4.1409	5.5000	4.5000	0.5521	8.0000	3.2000	4.1409	2.4845	9.8254	2.5	24.5636
98	4.0027	5.5000	4.5000	0.5337	8.0000	3.2000	4.0027	2.4016	9.6043	2.5	24.0108
99	3.8734	5.5000	4.5000	0.5165	8.0000	3.2000	3.8734	2.3240	9.3974	2.5	23.4936
100	3.7530	5.5000	4.5000	0.5004	8.0000	3.2000	3.7530	2.2518	9.2048	2.5	23.0120
101	3.6415	5.5000	4.5000	0.4855	8.0000	3.2000	3.6415	2.1849	9.0264	2.5	22.5660
102	3.5390	5.5000	4.5000	0.4719	8.0000	3.2000	3.5390	2.1234	8.8624	2.5	22.1560
103	3.4455	5.5000	4.5000	0.4594	8.0000	3.2000	3.4455	2.0673	8.7128	2.5	21.7820
104	3.3608	5.5000	4.5000	0.4481	8.0000	3.2000	3.3608	2.0165	8.5773	2.5	21.4432
105	3.2851	5.5000	4.5000	0.4380	8.0000	3.2000	3.2851	1.9711	8.4562	2.5	21.1404
106	3.2182	5.5000	4.5000	0.4291	8.0000	3.2000	3.2182	1.9309	8.3491	2.5	20.8728
107	3.1603	5.5000	4.5000	0.4214	8.0000	3.2000	3.1603	1.8962	8.2565	2.5	20.6412
108	3.1113	5.5000	4.5000	0.4148	8.0000	3.2000	3.1113	1.8668	8.1781	2.5	20.4452

Lanjutan tabel 4.2 Berat sendiri penampang gelagar tiap segmen tumpuan A - D

No nodal	h (m)	b (m)	b - 2tw (m)	tb (m)	B - 2tw (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	A total (m^2)	Bj beton (t/m^3)	BS (t/m)
109	3.0713	5.5000	4.5000	0.4095	8.0000	3.2000	3.0713	1.8428	8.1141	2.5	20.2852
110	3.0401	5.5000	4.5000	0.4053	8.0000	3.2000	3.0401	1.8241	8.0642	2.5	20.1604
111	3.0178	5.5000	4.5000	0.4024	8.0000	3.2000	3.0178	1.8107	8.0285	2.5	20.0712
112	3.0045	5.5000	4.5000	0.4006	8.0000	3.2000	3.0045	1.8027	8.0072	2.5	20.0180
113	3.0000	5.5000	4.5000	0.4000	8.0000	3.2000	3.0000	1.8000	8.0000	2.5	20.0000

4.5 Perhitungan Garis Netral Penampang Gelagar Tiap Segmen

Tumpuan A – D



Mengacu pada formula (3.12), maka diperoleh ;

y1 = 0,5.tf

= 0,5.0,4

= 0,2000 m

y2 = 0,5.h

= 0,5.3

= 1,5000 m

y3 = h - 0,5.tb

= 3 – 0,5.0,4

= 2,8000 m

Garis netral No nodal 1 terhadap sisi atas penampang adalah

$$= \frac{A1.y1 + A1.y2 + A3.y3}{A\ total}$$

$$= \frac{3,2000.0,2000 + 3,0000.1,5000 + 1,8000.2,8000}{8,0000}$$

= 1,2725 m

dimana ;

y1 = jarak titik berat A1 terhadap sisi atas gelagar

y2 = jarak titik berat A2 terhadap sisi atas gelagar

y3 = jarak titik berat A3 terhadap sisi atas gelagar

Untuk garis netral selanjutnya dapat dilihat pada tabel 4.3

Tabel 4.3 Garis netral penampang gelagar tiap segmen tumpuan A - D

No nodal	h (m)	y1 (m)	y2 (m)	tb (m)	y3 (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	A total (m^2)	Garis netral (m)
1	3.0000	0.2000	1.5000	0.4000	2.8000	3.2000	3.0000	1.8000	8.0000	1.2725
2	3.0045	0.2000	1.5023	0.4006	2.8042	3.2000	3.0045	1.8027	8.0072	1.2749
3	3.0178	0.2000	1.5089	0.4024	2.8166	3.2000	3.0178	1.8107	8.0285	1.2821
4	3.0401	0.2000	1.5201	0.4053	2.8374	3.2000	3.0401	1.8241	8.0642	1.2942
5	3.0713	0.2000	1.5357	0.4095	2.8665	3.2000	3.0713	1.8428	8.1141	1.3112
6	3.1113	0.2000	1.5557	0.4148	2.9039	3.2000	3.1113	1.8668	8.1781	1.3330
7	3.1603	0.2000	1.5802	0.4214	2.9496	3.2000	3.1603	1.8962	8.2565	1.3598
8	3.2182	0.2000	1.6091	0.4291	3.0037	3.2000	3.2182	1.9309	8.3491	1.3915
9	3.2851	0.2000	1.6426	0.4380	3.0661	3.2000	3.2851	1.9711	8.4562	1.4285
10	3.3608	0.2000	1.6804	0.4481	3.1367	3.2000	3.3608	2.0165	8.5773	1.4705
11	3.4455	0.2000	1.7228	0.4594	3.2158	3.2000	3.4455	2.0673	8.7128	1.5177
12	3.5390	0.2000	1.7695	0.4719	3.3031	3.2000	3.5390	2.1234	8.8624	1.5702
13	3.6415	0.2000	1.8208	0.4855	3.3987	3.2000	3.6415	2.1849	9.0264	1.6281
14	3.7530	0.2000	1.8765	0.5004	3.5028	3.2000	3.7530	2.2518	9.2048	1.6915
15	3.8734	0.2000	1.9367	0.5165	3.6152	3.2000	3.8734	2.3240	9.3974	1.7604
16	4.0027	0.2000	2.0014	0.5337	3.7359	3.2000	4.0027	2.4016	9.6043	1.8349
17	4.1409	0.2000	2.0705	0.5521	3.8648	3.2000	4.1409	2.4845	9.8254	1.9150
18	4.2881	0.2000	2.1441	0.5717	4.0022	3.2000	4.2881	2.5729	10.0610	2.0009
19	4.4443	0.2000	2.2222	0.5926	4.1480	3.2000	4.4443	2.6666	10.3109	2.0926
20	4.6094	0.2000	2.3047	0.6146	4.3021	3.2000	4.6094	2.7656	10.5750	2.1902
21	4.7835	0.2000	2.3918	0.6378	4.4646	3.2000	4.7835	2.8701	10.8536	2.2937
22	4.9666	0.2000	2.4833	0.6622	4.6355	3.2000	4.9666	2.9800	11.1466	2.4032
23	5.1586	0.2000	2.5793	0.6878	4.8147	3.2000	5.1586	3.0952	11.4538	2.5186
24	5.3597	0.2000	2.6799	0.7146	5.0024	3.2000	5.3597	3.2158	11.7755	2.6402
25	5.5697	0.2000	2.7849	0.7426	5.1984	3.2000	5.5697	3.3418	12.1115	2.7678
26	5.7888	0.2000	2.8944	0.7718	5.4029	3.2000	5.7888	3.4733	12.4621	2.9017
27	6.0168	0.2000	3.0084	0.8022	5.6157	3.2000	6.0168	3.6101	12.8269	3.0416

Lanjutan tabel 4.3 Garis netral penampang gelagar tiap segmen tumpuan A - D

No nodal	h (m)	y1 (m)	y2 (m)	tb (m)	y3 (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	A total (m^2)	Garis netral (m)
28	6.2539	0.2000	3.1270	0.8339	5.8370	3.2000	6.2539	3.7523	13.2062	3.1877
29	6.5000	0.2000	3.2500	0.8667	6.0667	3.2000	6.5000	3.9000	13.6000	3.3401
30	6.2539	0.2000	3.1270	0.8339	5.8370	3.2000	6.2539	3.7523	13.2062	3.1877
31	6.0168	0.2000	3.0084	0.8022	5.6157	3.2000	6.0168	3.6101	12.8269	3.0416
32	5.7888	0.2000	2.8944	0.7718	5.4029	3.2000	5.7888	3.4733	12.4621	2.9017
33	5.5697	0.2000	2.7849	0.7426	5.1984	3.2000	5.5697	3.3418	12.1115	2.7678
34	5.3597	0.2000	2.6799	0.7146	5.0024	3.2000	5.3597	3.2158	11.7755	2.6402
35	5.1586	0.2000	2.5793	0.6878	4.8147	3.2000	5.1586	3.0952	11.4538	2.5186
36	4.9666	0.2000	2.4833	0.6622	4.6355	3.2000	4.9666	2.9800	11.1466	2.4032
37	4.7835	0.2000	2.3918	0.6378	4.4646	3.2000	4.7835	2.8701	10.8536	2.2937
38	4.6094	0.2000	2.3047	0.6146	4.3021	3.2000	4.6094	2.7656	10.5750	2.1902
39	4.4443	0.2000	2.2222	0.5926	4.1480	3.2000	4.4443	2.6666	10.3109	2.0926
40	4.2881	0.2000	2.1441	0.5717	4.0022	3.2000	4.2881	2.5729	10.0610	2.0009
41	4.1409	0.2000	2.0705	0.5521	3.8648	3.2000	4.1409	2.4845	9.8254	1.9150
42	4.0027	0.2000	2.0014	0.5337	3.7359	3.2000	4.0027	2.4016	9.6043	1.8349
43	3.8734	0.2000	1.9367	0.5165	3.6152	3.2000	3.8734	2.3240	9.3974	1.7604
44	3.7530	0.2000	1.8765	0.5004	3.5028	3.2000	3.7530	2.2518	9.2048	1.6915
45	3.6415	0.2000	1.8208	0.4855	3.3987	3.2000	3.6415	2.1849	9.0264	1.6281
46	3.5390	0.2000	1.7695	0.4719	3.3031	3.2000	3.5390	2.1234	8.8624	1.5702
47	3.4455	0.2000	1.7228	0.4594	3.2158	3.2000	3.4455	2.0673	8.7128	1.5177
48	3.3608	0.2000	1.6804	0.4481	3.1367	3.2000	3.3608	2.0165	8.5773	1.4705
49	3.2851	0.2000	1.6426	0.4380	3.0661	3.2000	3.2851	1.9711	8.4562	1.4285
50	3.2182	0.2000	1.6091	0.4291	3.0037	3.2000	3.2182	1.9309	8.3491	1.3915
51	3.1603	0.2000	1.5802	0.4214	2.9496	3.2000	3.1603	1.8962	8.2565	1.3598
52	3.1113	0.2000	1.5557	0.4148	2.9039	3.2000	3.1113	1.8668	8.1781	1.3330
53	3.0713	0.2000	1.5357	0.4095	2.8665	3.2000	3.0713	1.8428	8.1141	1.3112
54	3.0401	0.2000	1.5201	0.4053	2.8374	3.2000	3.0401	1.8241	8.0642	1.2942

Lanjutan tabel 4.3 Garis netral penampang gelagar tiap segmen tumpuan A - D

No nodal	h (m)	y1 (m)	y2 (m)	tb (m)	y3 (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	A total (m^2)	Garis netral (m)
55	3.0178	0.2000	1.5089	0.4024	2.8166	3.2000	3.0178	1.8107	8.0285	1.2821
56	3.0045	0.2000	1.5023	0.4006	2.8042	3.2000	3.0045	1.8027	8.0072	1.2749
57	3.0000	0.2000	1.5000	0.4000	2.8000	3.2000	3.0000	1.8000	8.0000	1.2725
58	3.0045	0.2000	1.5023	0.4006	2.8042	3.2000	3.0045	1.8027	8.0072	1.2749
59	3.0178	0.2000	1.5089	0.4024	2.8166	3.2000	3.0178	1.8107	8.0285	1.2821
60	3.0401	0.2000	1.5201	0.4053	2.8374	3.2000	3.0401	1.8241	8.0642	1.2942
61	3.0713	0.2000	1.5357	0.4095	2.8665	3.2000	3.0713	1.8428	8.1141	1.3112
62	3.1113	0.2000	1.5557	0.4148	2.9039	3.2000	3.1113	1.8668	8.1781	1.3330
63	3.1603	0.2000	1.5802	0.4214	2.9496	3.2000	3.1603	1.8962	8.2565	1.3598
64	3.2182	0.2000	1.6091	0.4291	3.0037	3.2000	3.2182	1.9309	8.3491	1.3915
65	3.2851	0.2000	1.6426	0.4380	3.0661	3.2000	3.2851	1.9711	8.4562	1.4285
66	3.3608	0.2000	1.6804	0.4481	3.1367	3.2000	3.3608	2.0165	8.5773	1.4705
67	3.4455	0.2000	1.7228	0.4594	3.2158	3.2000	3.4455	2.0673	8.7128	1.5177
68	3.5390	0.2000	1.7695	0.4719	3.3031	3.2000	3.5390	2.1234	8.8624	1.5702
69	3.6415	0.2000	1.8208	0.4855	3.3987	3.2000	3.6415	2.1849	9.0264	1.6281
70	3.7530	0.2000	1.8765	0.5004	3.5028	3.2000	3.7530	2.2518	9.2048	1.6915
71	3.8734	0.2000	1.9367	0.5165	3.6152	3.2000	3.8734	2.3240	9.3974	1.7604
72	4.0027	0.2000	2.0014	0.5337	3.7359	3.2000	4.0027	2.4016	9.6043	1.8349
73	4.1409	0.2000	2.0705	0.5521	3.8648	3.2000	4.1409	2.4845	9.8254	1.9150
74	4.2881	0.2000	2.1441	0.5717	4.0022	3.2000	4.2881	2.5729	10.0610	2.0009
75	4.4443	0.2000	2.2222	0.5926	4.1480	3.2000	4.4443	2.6666	10.3109	2.0926
76	4.6094	0.2000	2.3047	0.6146	4.3021	3.2000	4.6094	2.7656	10.5750	2.1902
77	4.7835	0.2000	2.3918	0.6378	4.4646	3.2000	4.7835	2.8701	10.8536	2.2937
78	4.9666	0.2000	2.4833	0.6622	4.6355	3.2000	4.9666	2.9800	11.1466	2.4032
79	5.1586	0.2000	2.5793	0.6878	4.8147	3.2000	5.1586	3.0952	11.4538	2.5186
80	5.3597	0.2000	2.6799	0.7146	5.0024	3.2000	5.3597	3.2158	11.7755	2.6402
81	5.5697	0.2000	2.7849	0.7426	5.1984	3.2000	5.5697	3.3418	12.1115	2.7678

Lanjutan tabel 4.3 Garis netral penampang gelagar tiap segmen tumpuan A - D

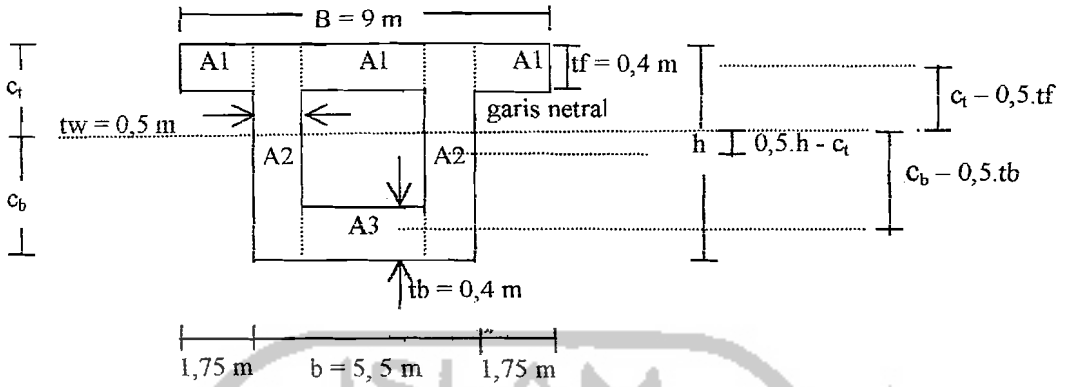
No nodal	h (m)	y1 (m)	y2 (m)	tb (m)	y3 (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	A total (m^2)	Garis netral (m)
82	5.7888	0.2000	2.8944	0.7718	5.4029	3.2000	5.7888	3.4733	12.4621	2.9017
83	6.0168	0.2000	3.0084	0.8022	5.6157	3.2000	6.0168	3.6101	12.8269	3.0416
84	6.2539	0.2000	3.1270	0.8339	5.8370	3.2000	6.2539	3.7523	13.2062	3.1877
85	6.5000	0.2000	3.2500	0.8667	6.0667	3.2000	6.5000	3.9000	13.6000	3.3401
86	6.2539	0.2000	3.1270	0.8339	5.8370	3.2000	6.2539	3.7523	13.2062	3.1877
87	6.0168	0.2000	3.0084	0.8022	5.6157	3.2000	6.0168	3.6101	12.8269	3.0416
88	5.7888	0.2000	2.8944	0.7718	5.4029	3.2000	5.7888	3.4733	12.4621	2.9017
89	5.5697	0.2000	2.7849	0.7426	5.1984	3.2000	5.5697	3.3418	12.1115	2.7678
90	5.3597	0.2000	2.6799	0.7146	5.0024	3.2000	5.3597	3.2158	11.7755	2.6402
91	5.1586	0.2000	2.5793	0.6878	4.8147	3.2000	5.1586	3.0952	11.4538	2.5186
92	4.9666	0.2000	2.4833	0.6622	4.6355	3.2000	4.9666	2.9800	11.1466	2.4032
93	4.7835	0.2000	2.3918	0.6378	4.4646	3.2000	4.7835	2.8701	10.8536	2.2937
94	4.6094	0.2000	2.3047	0.6146	4.3021	3.2000	4.6094	2.7656	10.5750	2.1902
95	4.4443	0.2000	2.2222	0.5926	4.1480	3.2000	4.4443	2.6666	10.3109	2.0926
96	4.2881	0.2000	2.1441	0.5717	4.0022	3.2000	4.2881	2.5729	10.0610	2.0009
97	4.1409	0.2000	2.0705	0.5521	3.8648	3.2000	4.1409	2.4845	9.8254	1.9150
98	4.0027	0.2000	2.0014	0.5337	3.7359	3.2000	4.0027	2.4016	9.5043	1.8349
99	3.8734	0.2000	1.9367	0.5165	3.6152	3.2000	3.8734	2.3240	9.3974	1.7604
100	3.7530	0.2000	1.8765	0.5004	3.5028	3.2000	3.7530	2.2518	9.2048	1.6915
101	3.6415	0.2000	1.8208	0.4855	3.3987	3.2000	3.6415	2.1849	9.0264	1.6281
102	3.5390	0.2000	1.7695	0.4719	3.3031	3.2000	3.5390	2.1234	8.8624	1.5702
103	3.4455	0.2000	1.7228	0.4594	3.2158	3.2000	3.4455	2.0673	8.7128	1.5177
104	3.3608	0.2000	1.6804	0.4481	3.1367	3.2000	3.3608	2.0165	8.5773	1.4705
105	3.2851	0.2000	1.6426	0.4380	3.0661	3.2000	3.2851	1.9711	8.4562	1.4285
106	3.2182	0.2000	1.6091	0.4291	3.0037	3.2000	3.2182	1.9309	8.3491	1.3915
107	3.1603	0.2000	1.5802	0.4214	2.9496	3.2000	3.1603	1.8962	8.2565	1.3598
108	3.1113	0.2000	1.5557	0.4148	2.9039	3.2000	3.1113	1.8668	8.1781	1.3330

Lanjutan tabel 4.3 Garis netral penampang gelagar tiap segmen tumpuan A - D

No nodal	h (m)	y1 (m)	y2 (m)	tb (m)	y3 (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	A total (m^2)	Garis netral (m)
109	3.0713	0.2000	1.5357	0.4095	2.8665	3.2000	3.0713	1.8428	8.1141	1.3112
110	3.0401	0.2000	1.5201	0.4053	2.8374	3.2000	3.0401	1.8241	8.0642	1.2942
111	3.0178	0.2000	1.5089	0.4024	2.8166	3.2000	3.0178	1.8107	8.0285	1.2821
112	3.0045	0.2000	1.5023	0.4006	2.8042	3.2000	3.0045	1.8027	8.0072	1.2749
113	3.0000	0.2000	1.5000	0.4000	2.8000	3.2000	3.0000	1.8000	8.0000	1.2725

4.6 Perhitungan Inersia Penampang Gelagar Tiap Segmen

Tumpuan A – D



Mengacu pada formula (3.13) sampai (3.16), maka diperoleh ;

$c_t = 1{,}2725$ m

$c_b = h - c_t$

$= 3 - 1{,}2725$

$= 1{,}7275$ m

Inersia 1 $= 1/12.(B - 2.tw).tf^3 + A1.(c_t - 0{,}5.tf)^2$

$= 1/12.(9 - 2.0{,}5).0{,}4^3 + 3{,}2.(1{,}273 - 0{,}5.0{,}4)^2$

$= 3{,}7235\ m^4$

Inersia 2 $= 2.[1/12.tw.h^3 + tw.h.(0{,}5.h - c_t)^2]$

$= 2.[1/12.0{,}5.3^3 + 0{,}5.3.(0{,}5.3 - 1{,}2725)^2]$

$= 2{,}4053\ m^4$

Inersia 3 $= 1/12.(b - 2.tw).tb^3 + A3.(c_t - 0{,}5.tb)^2$

$= 1/12.(5{,}5 - 2.0{,}5).0{,}4^3 + 1{,}8.(1{,}7275 - 0{,}5.0{,}4)^2$

$= 4{,}2239\ m^4$

Inersia total No nodal 1 adalah = Inersia 1 + Inersia 2 + Inersia 3

= 3,7235 + 2,4053 + 4,2239

= 10,3526 m^4

dimana ;

c_t = jarak garis netral terhadap sisi atas gelagar

c_b = jarak garis netral terhadap sisi bawah gelagar

Inersia 1 = inersia A1 terhadap garis netral

Inersia 2 = inersia A2 terhadap garis netral

Inersia 3 = inersia A3 terhadap garis netral

Untuk inersia selanjutnya dapat dilihat pada tabel 4.4

Tabel 4.4 Inersia penampamg gelagar tiap segmen tumpuan A - D

No nodal	h (m)	ct (m)	cb (m)	B - 2tw (m)	tf (m)	tw (m)	b - 2tw (m)	tb (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	Inersia 1 (m^4)	Inersia 2 (m^4)	Inersia 3 (m^4)	I total (m^4)
1	3.0000	1.2725	1.7275	8.0000	0.4000	0.5000	4.5000	0.4000	3.2000	3.0000	1.8000	3.7235	2.4053	4.2239	10.3526
2	3.0045	1.2749	1.7296	8.0000	0.4000	0.5000	4.5000	0.4006	3.2000	3.0045	1.8027	3.7400	2.4154	4.2402	10.3956
3	3.0178	1.2821	1.7357	8.0000	0.4000	0.5000	4.5000	0.4024	3.2000	3.0178	1.8107	3.7897	2.4455	4.2881	10.5233
4	3.0401	1.2942	1.7459	8.0000	0.4000	0.5000	4.5000	0.4053	3.2000	3.0401	1.8241	3.8739	2.4965	4.3693	10.7397
5	3.0713	1.3112	1.7601	8.0000	0.4000	0.5000	4.5000	0.4095	3.2000	3.0713	1.8428	3.9939	2.5690	4.4837	11.0466
6	3.1113	1.3330	1.7783	8.0000	0.4000	0.5000	4.5000	0.4148	3.2000	3.1113	1.8668	4.1505	2.6641	4.6335	11.4481
7	3.1603	1.3598	1.8005	8.0000	0.4000	0.5000	4.5000	0.4214	3.2000	3.1603	1.8962	4.3471	2.7837	4.8206	11.9515
8	3.2182	1.3915	1.8267	8.0000	0.4000	0.5000	4.5000	0.4291	3.2000	3.2182	1.9309	4.5856	2.9299	5.0481	12.5636
9	3.2851	1.4285	1.8566	8.0000	0.4000	0.5000	4.5000	0.4380	3.2000	3.2851	1.9711	4.8721	3.1049	5.3175	13.2945
10	3.3608	1.4705	1.8903	8.0000	0.4000	0.5000	4.5000	0.4481	3.2000	3.3608	2.0165	5.2080	3.3114	5.6323	14.1518
11	3.4455	1.5177	1.9278	8.0000	0.4000	0.5000	4.5000	0.4594	3.2000	3.4455	2.0673	5.5989	3.5535	5.9975	15.1499
12	3.5390	1.5702	1.9688	8.0000	0.4000	0.5000	4.5000	0.4719	3.2000	3.5390	2.1234	6.0505	3.8343	6.4155	16.3002
13	3.6415	1.6281	2.0134	8.0000	0.4000	0.5000	4.5000	0.4855	3.2000	3.6415	2.1849	6.5690	4.1592	6.8930	17.6212
14	3.7530	1.6915	2.0615	8.0000	0.4000	0.5000	4.5000	0.5004	3.2000	3.7530	2.2518	7.1613	4.5335	7.4347	19.1295
15	3.8734	1.7604	2.1130	8.0000	0.4000	0.5000	4.5000	0.5165	3.2000	3.8734	2.3240	7.8342	4.9632	8.0465	20.8438
16	4.0027	1.8349	2.1678	8.0000	0.4000	0.5000	4.5000	0.5337	3.2000	4.0027	2.4016	8.5959	5.4550	8.7355	22.7864
17	4.1409	1.9150	2.2259	8.0000	0.4000	0.5000	4.5000	0.5521	3.2000	4.1409	2.4845	9.4546	6.0171	9.5090	24.9806
18	4.2881	2.0009	2.2872	8.0000	0.4000	0.5000	4.5000	0.5717	3.2000	4.2881	2.5729	10.4210	6.6586	10.3756	27.4552
19	4.4443	2.0926	2.3517	8.0000	0.4000	0.5000	4.5000	0.5926	3.2000	4.4443	2.6666	11.5049	7.3898	11.3435	30.2382
20	4.6094	2.1902	2.4192	8.0000	0.4000	0.5000	4.5000	0.6146	3.2000	4.6094	2.7656	12.7175	8.2216	12.4220	33.3611
21	4.7835	2.2937	2.4898	8.0000	0.4000	0.5000	4.5000	0.6378	3.2000	4.7835	2.8701	14.0701	9.1673	13.6235	36.8609
22	4.9666	2.4032	2.5634	8.0000	0.4000	0.5000	4.5000	0.6622	3.2000	4.9666	2.9800	15.5758	10.2412	14.9587	40.7756
23	5.1586	2.5186	2.6400	8.0000	0.4000	0.5000	4.5000	0.6878	3.2000	5.1586	3.0952	17.2456	11.4587	16.4401	45.1444
24	5.3597	2.6402	2.7195	8.0000	0.4000	0.5000	4.5000	0.7146	3.2000	5.3597	3.2158	19.0973	12.8388	18.0810	50.0171
25	5.5697	2.7678	2.8019	8.0000	0.4000	0.5000	4.5000	0.7426	3.2000	5.5697	3.3418	21.1422	14.4000	19.8963	55.4385
26	5.7888	2.9017	2.8871	8.0000	0.4000	0.5000	4.5000	0.7718	3.2000	5.7888	3.4733	23.4001	16.1656	21.9014	61.4671
27	6.0168	3.0416	2.9752	8.0000	0.4000	0.5000	4.5000	0.8022	3.2000	6.0168	3.6101	25.8817	18.1583	24.1141	68.1540

Lanjutan tabel 4.4 Inersia penampamg gelagar tiap segmen tumpuan A - D

No nodal	h (m)	ct (m)	cb (m)	B - 2tw (m)	tf (m)	tw (m)	b - 2tw (m)	tb (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	Inersia 1 (m^4)	Inersia 2 (m^4)	Inersia 3 (m^4)	I total (m^4)
28	6.2539	3.1877	3.0662	8.0000	0.4000	0.5000	4.5000	0.8339	3.2000	6.2539	3.7523	28.6070	20.4062	26.5531	75.5663
29	6.5000	3.3401	3.1599	8.0000	0.4000	0.5000	4.5000	0.8667	3.2000	6.5000	3.9000	31.5954	22.9382	29.2370	83.7706
30	6.2539	3.1877	3.0662	8.0000	0.4000	0.5000	4.5000	0.8339	3.2000	6.2539	3.7523	28.6070	20.4062	26.5531	75.5663
31	6.0168	3.0416	2.9752	8.0000	0.4000	0.5000	4.5000	0.8022	3.2000	6.0168	3.6101	25.8817	18.1583	24.1141	68.1540
32	5.7888	2.9017	2.8871	8.0000	0.4000	0.5000	4.5000	0.7718	3.2000	5.7888	3.4733	23.4001	16.1656	21.9014	61.4671
33	5.5697	2.7678	2.8019	8.0000	0.4000	0.5000	4.5000	0.7426	3.2000	5.5697	3.3418	21 1422	14.4000	19.8963	55.4385
34	5.3597	2.6402	2.7195	8.0000	0.4000	0.5000	4.5000	0.7146	3.2000	5.3597	3.2158	19 0973	12.8388	18.0810	50.0171
35	5.1586	2.5186	2.6400	8.0000	0.4000	0.5000	4.5000	0.6878	3.2000	5.1586	3.0952	17.2456	11.4587	16.4401	45.1444
36	4.9666	2.4032	2.5634	8.0000	0.4000	0.5000	4.5000	0.6622	3.2000	4.9666	2.9800	15.5758	10.2412	14.9587	40.7756
37	4.7835	2.2937	2.4898	8.0000	0.4000	0.5000	4.5000	0.6378	3.2000	4.7835	2.8701	14.0701	9.1673	13.6235	36.8609
38	4.6094	2.1902	2.4192	8.0000	0.4000	0.5000	4.5000	0.6146	3.2000	4.6094	2.7656	12.7175	8.2216	12.4220	33.3611
39	4.4443	2.0926	2.3517	8.0000	0.4000	0.5000	4.5000	0.5926	3.2000	4.4443	2.6666	11.5049	7.3898	11.3435	30.2382
40	4.2881	2.0009	2.2872	8.0000	0.4000	0.5000	4.5000	0.5717	3.2000	4.2881	2.5729	10.4210	6.6586	10.3756	27.4552
41	4.1409	1.9150	2.2259	8.0000	0.4000	0.5000	4.5000	0.5521	3.2000	4.1409	2.4845	9.4546	6.0171	9.5090	24.9806
42	4.0027	1.8349	2.1678	8.0000	0.4000	0.5000	4.5000	0.5337	3.2000	4.0027	2.4016	8.5959	5.4550	8.7355	22.7864
43	3.8734	1.7604	2.1130	8.0000	0.4000	0.5000	4.5000	0.5165	3.2000	3.8734	2.3240	7.8342	4.9632	8.0465	20.8438
44	3.7530	1.6915	2.0615	8.0000	0.4000	0.5000	4.5000	0.5004	3.2000	3.7530	2.2518	7.1613	4.5335	7.4347	19.1295
45	3.6415	1.6281	2.0134	8.0000	0.4000	0.5000	4.5000	0.4855	3.2000	3.6415	2.1849	6.5690	4.1592	6.8930	17.6212
46	3.5390	1.5702	1.9688	8.0000	0.4000	0.5000	4.5000	0.4719	3.2000	3.5390	2.1234	6.0505	3.8343	6.4155	16.3002
47	3.4455	1.5177	1.9278	8.0000	0.4000	0.5000	4.5000	0.4594	3.2000	3.4455	2.0673	5.5989	3.5535	5.9975	15.1499
48	3.3608	1.4705	1.8903	8.0000	0.4000	0.5000	4.5000	0.4481	3.2000	3.3608	2.0165	5.2080	3.3114	5.6323	14.1518
49	3.2851	1.4285	1.8566	8.0000	0.4000	0.5000	4.5000	0.4380	3.2000	3.2851	1.9711	4.8721	3.1049	5.3175	13.2945
50	3.2182	1.3915	1.8267	8.0000	0.4000	0.5000	4.5000	0.4291	3.2000	3.2182	1.9309	4.5856	2.9299	5.0481	12.5636
51	3.1603	1.3598	1.8005	8.0000	0.4000	0.5000	4.5000	0.4214	3.2000	3.1603	1.8962	4.3471	2.7837	4.8206	11.9515
52	3.1113	1.3330	1.7783	8.0000	0.4000	0.5000	4.5000	0.4148	3.2000	3.1113	1.8668	4.1505	2.6641	4.6335	11.4481
53	3.0713	1.3112	1.7601	8.0000	0.4000	0.5000	4.5000	0.4095	3.2000	3.0713	1.8428	3.9939	2.5690	4.4837	11.0466
54	3.0401	1.2942	1.7459	8.0000	0.4000	0.5000	4.5000	0.4053	3.2000	3.0401	1.8241	3.8739	2.4965	4.3693	10.7397

Lanjutan tabel 4.4 Inersia penampamg gelagar tiap segmen tumpuan A - D

No nodal	h (m)	ct (m)	cb (m)	B - 2tw (m)	tf (m)	tw (m)	b - 2tw (m)	tb (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	Inersia 1 (m^4)	Inersia 2 (m^4)	Inersia 3 (m^4)	I total (m^4)
55	3.0178	1.2821	1.7357	8.0000	0.4000	0.5000	4.5000	0.8339	3.2000	3.0178	1.8107	3.7897	2.4455	3.3664	9.6016
56	3.0045	1.2749	1.7296	8.0000	0.4000	0.5000	4.5000	0.8667	3.2000	3.0045	1.8027	3.7400	2.4154	3.2732	9.4286
57	3.0000	1.2725	1.7275	8.0000	0.4000	0.5000	4.5000	0.8339	3.2000	3.0000	1.8000	3.7235	2.4053	3.3090	9.4378
58	3.0045	1.2749	1.7296	8.0000	0.4000	0.5000	4.5000	0.8022	3.2000	3.0045	1.8027	3.7400	2.4154	3.3752	9.5306
59	3.0178	1.2821	1.7357	8.0000	0.4000	0.5000	4.5000	0.7718	3.2000	3.0178	1.8107	3.7897	2.4455	3.4714	9.7066
60	3.0401	1.2942	1.7459	8.0000	0.4000	0.5000	4.5000	0.7426	3.2000	3.0401	1.8241	3.8739	2.4965	3.6002	9.9707
61	3.0713	1.3112	1.7601	8.0000	0.4000	0.5000	4.5000	0.7146	3.2000	3.0713	1.8428	3.9939	2.5690	3.7632	10.3261
62	3.1113	1.3330	1.7783	8.0000	0.4000	0.5000	4.5000	0.6878	3.2000	3.1113	1.8668	4.1505	2.6641	3.9630	10.7775
63	3.1603	1.3598	1.8005	8.0000	0.4000	0.5000	4.5000	0.6622	3.2000	3.1603	1.8962	4.3471	2.7837	4.2030	11.3339
64	3.2182	1.3915	1.8267	8.0000	0.4000	0.5000	4.5000	0.6378	3.2000	3.2182	1.9309	4.5856	2.9299	4.4871	12.0026
65	3.2851	1.4285	1.8566	8.0000	0.4000	0.5000	4.5000	0.6146	3.2000	3.2851	1.9711	4.8721	3.1049	4.8183	12.7954
66	3.3608	1.4705	1.8903	8.0000	0.4000	0.5000	4.5000	0.5926	3.2000	3.3608	2.0165	5.2080	3.3114	5.2016	13.7211
67	3.4455	1.5177	1.9278	8.0000	0.4000	0.5000	4.5000	0.5717	3.2000	3.4455	2.0673	5.5989	3.5535	5.6435	14.7959
68	3.5390	1.5702	1.9688	8.0000	0.4000	0.5000	4.5000	0.5521	3.2000	3.5390	2.1234	6.0505	3.8343	6.1475	16.0323
69	3.6415	1.6281	2.0134	8.0000	0.4000	0.5000	4.5000	0.5337	3.2000	3.6415	2.1849	6.5690	4.1592	6.7219	17.4500
70	3.7530	1.6915	2.0615	8.0000	0.4000	0.5000	4.5000	0.5165	3.2000	3.7530	2.2518	7.1613	4.5335	7.3739	19.0687
71	3.8734	1.7604	2.1130	8.0000	0.4000	0.5000	4.5000	0.5004	3.2000	3.8734	2.3240	7.8342	4.9632	8.1113	20.9087
72	4.0027	1.8349	2.1678	8.0000	0.4000	0.5000	4.5000	0.4855	3.2000	4.0027	2.4016	8.5959	5.4550	8.9428	22.9938
73	4.1409	1.9150	2.2259	8.0000	0.4000	0.5000	4.5000	0.4719	3.2000	4.1409	2.4845	9.4546	6.0171	9.8778	25.3495
74	4.2881	2.0009	2.2872	8.0000	0.4000	0.5000	4.5000	0.4594	3.2000	4.2881	2.5729	10.4210	6.6586	10.9282	28.0079
75	4.4443	2.0926	2.3517	8.0000	0.4000	0.5000	4.5000	0.4481	3.2000	4.4443	2.6666	11.5049	7.3898	12.1052	30.9998
76	4.6094	2.1902	2.4192	8.0000	0.4000	0.5000	4.5000	0.4380	3.2000	4.6094	2.7656	12.7175	8.2216	13.4194	34.3586
77	4.7835	2.2937	2.4898	8.0000	0.4000	0.5000	4.5000	0.4291	3.2000	4.7835	2.8701	14.0701	9.1673	14.8875	38.1249
78	4.9666	2.4032	2.5634	8.0000	0.4000	0.5000	4.5000	0.4214	3.2000	4.9666	2.9800	15.5758	10.2412	16.5229	42.3399
79	5.1586	2.5186	2.6400	8.0000	0.4000	0.5000	4.5000	0.4148	3.2000	5.1586	3.0952	17.2456	11.4587	18.3427	47.0470
80	5.3597	2.6402	2.7195	8.0000	0.4000	0.5000	4.5000	0.4095	3.2000	5.3597	3.2158	19.0973	12.8388	20.3624	52.2985
81	5.5697	2.7678	2.8019	8.0000	0.4000	0.5000	4.5000	0.4053	3.2000	5.5697	3.3418	21.1422	14.4000	22.6025	58.1447

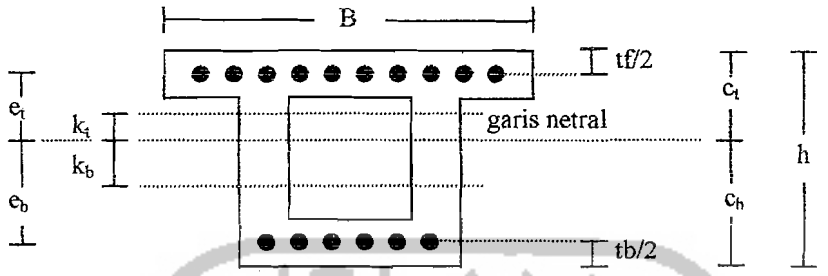
Lanjutan tabel 4.4 Inersia penampang gelagar tiap segmen tumpuan A - D

No nodal	h (m)	ct (m)	cb (m)	B - 2tw (m)	tf (m)	tw (m)	b - 2tw (m)	tb (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	Inersia 1 (m^4)	Inersia 2 (m^4)	Inersia 3 (m^4)	I total (m^4)
82	5.7888	2.9017	2.8871	8.0000	0.4000	0.5000	4.5000	0.7718	3.2000	5.7888	3.4733	23.4001	16.1656	21.9014	61.4671
83	6.0168	3.0416	2.9752	8.0000	0.4000	0.5000	4.5000	0.8022	3.2000	6.0168	3.6101	25.8817	18.1583	24.1141	68.1540
84	6.2539	3.1877	3.0662	8.0000	0.4000	0.5000	4.5000	0.8339	3.2000	6.2539	3.7523	28.6070	20.4062	26.5531	75.5663
85	6.5000	3.3401	3.1599	8.0000	0.4000	0.5000	4.5000	0.8667	3.2000	6.5000	3.9000	31.5954	22.9382	29.2370	83.7706
86	6.2539	3.1877	3.0662	8.0000	0.4000	0.5000	4.5000	0.8339	3.2000	6.2539	3.7523	28.6070	20.4062	26.5531	75.5663
87	6.0168	3.0416	2.9752	8.0000	0.4000	0.5000	4.5000	0.8022	3.2000	6.0168	3.6101	25.8817	18.1583	24.1141	68.1540
88	5.7888	2.9017	2.8871	8.0000	0.4000	0.5000	4.5000	0.7718	3.2000	5.7888	3.4733	23.4001	16.1656	21.9014	61.4671
89	5.5697	2.7678	2.8019	8.0000	0.4000	0.5000	4.5000	0.7426	3.2000	5.5697	3.3418	21.1422	14.4000	19.8963	55.4385
90	5.3597	2.6402	2.7195	8.0000	0.4000	0.5000	4.5000	0.7146	3.2000	5.3597	3.2158	19.0973	12.8388	18.0810	50.0171
91	5.1586	2.5186	2.6400	8.0000	0.4000	0.5000	4.5000	0.6878	3.2000	5.1586	3.0952	17.2456	11.4587	16.4401	45.1444
92	4.9666	2.4032	2.5634	8.0000	0.4000	0.5000	4.5000	0.6622	3.2000	4.9666	2.9800	15.5758	10.2412	14.9587	40.7756
93	4.7835	2.2937	2.4898	8.0000	0.4000	0.5000	4.5000	0.6378	3.2000	4.7835	2.8701	14.0701	9.1673	13.6235	36.8609
94	4.6094	2.1902	2.4192	8.0000	0.4000	0.5000	4.5000	0.6146	3.2000	4.6094	2.7656	12.7175	8.2216	12.4220	33.3611
95	4.4443	2.0926	2.3517	8.0000	0.4000	0.5000	4.5000	0.5926	3.2000	4.4443	2.6666	11.5049	7.3898	11.3435	30.2382
96	4.2881	2.0009	2.2872	8.0000	0.4000	0.5000	4.5000	0.5717	3.2000	4.2881	2.5729	10.4210	6.6586	10.3756	27.4552
97	4.1409	1.9150	2.2259	8.0000	0.4000	0.5000	4.5000	0.5521	3.2000	4.1409	2.4845	9.4546	6.0171	9.5090	24.9806
98	4.0027	1.8349	2.1678	8.0000	0.4000	0.5000	4.5000	0.5337	3.2000	4.0027	2.4016	8.5959	5.4550	8.7355	22.7864
99	3.8734	1.7604	2.1130	8.0000	0.4000	0.5000	4.5000	0.5165	3.2000	3.8734	2.3240	7.8342	4.9632	8.0465	20.8438
100	3.7530	1.6915	2.0615	8.0000	0.4000	0.5000	4.5000	0.5004	3.2000	3.7530	2.2518	7.1613	4.5335	7.4347	19.1295
101	3.6415	1.6281	2.0134	8.0000	0.4000	0.5000	4.5000	0.4855	3.2000	3.6415	2.1849	6.5690	4.1592	6.8930	17.6212
102	3.5390	1.5702	1.9688	8.0000	0.4000	0.5000	4.5000	0.4719	3.2000	3.5390	2.1234	6.0505	3.8343	6.4155	16.3002
103	3.4455	1.5177	1.9278	8.0000	0.4000	0.5000	4.5000	0.4594	3.2000	3.4455	2.0673	5.5989	3.5535	5.9975	15.1499
104	3.3608	1.4705	1.8903	8.0000	0.4000	0.5000	4.5000	0.4481	3.2000	3.3608	2.0165	5.2080	3.3114	5.6323	14.1518
105	3.2851	1.4285	1.8566	8.0000	0.4000	0.5000	4.5000	0.4380	3.2000	3.2851	1.9711	4.8721	3.1049	5.3175	13.2945
106	3.2182	1.3915	1.8267	8.0000	0.4000	0.5000	4.5000	0.4291	3.2000	3.2182	1.9309	4.5856	2.9299	5.0481	12.5636
107	3.1603	1.3598	1.8005	8.0000	0.4000	0.5000	4.5000	0.4214	3.2000	3.1603	1.8962	4.3471	2.7837	4.8206	11.9515
108	3.1113	1.3330	1.7783	8.0000	0.4000	0.5000	4.5000	0.4148	3.2000	3.1113	1.8668	4.1505	2.6641	4.6335	11.4481

Lanjutan tabel 4.4 Inersia penampamg gelagar tiap segmen tumpuan A - D

No nodal	h (m)	ct (m)	cb (m)	B - 2tw (m)	tf (m)	tw (m)	b - 2tw (m)	tb (m)	A1 (m^2)	A2 (m^2)	A3 (m^2)	Inersia 1 (m^4)	Inersia 2 (m^4)	Inersia 3 (m^4)	I total (m^4)
109	3.0713	1.3112	1.7601	8.0000	0.4000	0.5000	4.5000	0.4095	3.2000	3.0713	1.8428	3.9939	2.5690	4.4837	11.0466
110	3.0401	1.2942	1.7459	8.0000	0.4000	0.5000	4.5000	0.4053	3.2000	3.0401	1.8241	3.8739	2.4965	4.3693	10.7397
111	3.0178	1.2821	1.7357	8.0000	0.4000	0.5000	4.5000	0.4024	3.2000	3.0178	1.8107	3.7897	2.4455	4.2881	10.5233
112	3.0045	1.2749	1.7296	8.0000	0.4000	0.5000	4.5000	0.4006	3.2000	3.0045	1.8027	3.7400	2.4154	4.2402	10.3956
113	3.0000	1.2725	1.7275	8.0000	0.4000	0.5000	4.5000	0.4000	3.2000	3.0000	1.8000	3.7235	2.4053	4.2239	10.3526

4.7 Perhitungan Eksentrisitas Atas Dan Bawah, Kern Atas Dan Bawah, Modulus Penampang Atas Dan Bawah Tiap Segmen Tumpuan A - D



4.7.1 Eksentrisitas atas dan bawah

Mengacu pada formula (3.17) dan (3.18), maka diperoleh ;

Eksentrisitas atas No nodal 1 adalah

Eksentrisitas atas (e_t) = $c_t - tf/2$

= 1,2725 – 0,4/2

= 1,0725 m

Eksentrisitas bawah No nodal 1 adalah

Eksentrisitas bawah (e_b) = $c_b - tb/2$

= 1,7275 – 0,4/2

= 1,5275 m

Untuk eksentrisitas atas dan bawah selanjutnya dapat dilihat pada tabel 4. 5

4.7.2 Kern atas dan bawah

Mengacu pada formula (3.19) dan (3.20), maka diperoleh ;

Kern atas No nodal 1 adalah

$$\text{Kern atas } (k_t) = \frac{I}{Ac.c_b}$$

$$= \frac{10,3526}{8.1,7275}$$

$$= 0,7491 \text{ m}$$

Kern bawah No nodal 1 adalah

$$\text{Kern bawah } (k_b) = \frac{I}{Ac.c_t}$$

$$= \frac{10,3526}{8.1,2725}$$

$$= 1,0170 \text{ m}$$

Untuk kern atas dan bawah selanjutnya dapat dilihat pada tabel 4. 5

4.7.3 Modulus penampang atas dan bawah

Mengacu pada formula (3.21) dan (3.22), maka diperoleh ;

Modulus penampang atas No nodal 1 adalah

Modulus penampang atas $(Z_t) = \frac{I}{c_t}$

$$= \frac{10,3526}{1,2725}$$

$$= 8,1356 \text{ m}^3$$

Modulus penampang bawah No nodal 1 adalah

Modulus penampang bawah $(Z_b) = \frac{I}{c_b}$

$$= \frac{10,3526}{1,7275}$$

$$= 5,9928 \text{ m}^3$$

Untuk modulus atas dan bawah selanjutnya dapat dilihat pada tabel 4. 5

dimana ;

I = I total (Inersia 1 + Inersia 2 + Inersia 3)

Ac = A total (A1 + A2 + A3)

Tabel 4.5 Eksentrisitas atas dan bawah, kern atas dan bawah, modulus penampang atas dan bawah tiap segmen tumpuan A - D

No nodal	h (m)	tf (m)	tb (m)	ct (m)	cb (m)	I total (m^4)	Ac (m^2)	et (m)	eb (m)	kt (m)	kb (m)	Zt (m)	Zb (m)
1	3.0000	0.4000	0.4000	1.2725	1.7275	10.3526	8.0000	1.0725	1.5275	0.7491	1.0170	8.1356	5.9928
2	3.0045	0.4000	0.4006	1.2749	1.7296	10.3956	8.0072	1.0749	1.5293	0.7506	1.0183	8.1541	6.0104
3	3.0178	0.4000	0.4024	1.2821	1.7357	10.5233	8.0285	1.0821	1.5345	0.7552	1.0223	8.2079	6.0629
4	3.0401	0.4000	0.4053	1.2942	1.7459	10.7397	8.0642	1.0942	1.5433	0.7628	1.0290	8.2983	6.1514
5	3.0713	0.4000	0.4095	1.3112	1.7601	11.0466	8.1141	1.1112	1.5554	0.7735	1.0383	8.4248	6.2761
6	3.1113	0.4000	0.4148	1.3330	1.7783	11.4481	8.1781	1.1330	1.5709	0.7872	1.0501	8.5882	6.4377
7	3.1603	0.4000	0.4214	1.3598	1.8005	11.9515	8.2565	1.1598	1.5898	0.8040	1.0645	8.7892	6.6379
8	3.2182	0.4000	0.4291	1.3915	1.8267	12.5636	8.3491	1.1915	1.6122	0.8238	1.0814	9.0288	6.8778
9	3.2851	0.4000	0.4380	1.4285	1.8566	13.2945	8.4562	1.2285	1.6376	0.8468	1.1006	9.3066	7.1607
10	3.3608	0.4000	0.4481	1.4705	1.8903	14.1518	8.5773	1.2705	1.6663	0.8728	1.1220	9.6238	7.4865
11	3.4455	0.4000	0.4594	1.5177	1.9278	15.1499	8.7128	1.3177	1.6981	0.9020	1.1457	9.9821	7.8586
12	3.5390	0.4000	0.4719	1.5702	1.9688	16.3002	8.8624	1.3702	1.7329	0.9342	1.1713	10.3810	8.2793
13	3.6415	0.4000	0.4855	1.6281	2.0134	17.6212	9.0264	1.4281	1.7707	0.9696	1.1991	10.8232	8.7520
14	3.7530	0.4000	0.5004	1.6915	2.0615	19.1295	9.2048	1.4915	1.8113	1.0081	1.2286	11.3092	9.2794
15	3.8734	0.4000	0.5165	1.7604	2.1130	20.8438	9.3974	1.5604	1.8548	1.0497	1.2600	11.8404	9.8646
16	4.0027	0.4000	0.5337	1.8349	2.1678	22.7864	9.6043	1.6349	1.9010	1.0944	1.2930	12.4183	10.5113
17	4.1409	0.4000	0.5521	1.9150	2.2259	24.9806	9.8254	1.7150	1.9499	1.1422	1.3277	13.0447	11.2227
18	4.2881	0.4000	0.5717	2.0009	2.2872	27.4552	10.0610	1.8009	2.0014	1.1931	1.3638	13.7214	12.0038
19	4.4443	0.4000	0.5926	2.0926	2.3517	30.2382	10.3109	1.8926	2.0554	1.2470	1.4014	14.4501	12.8580
20	4.6094	0.4000	0.6146	2.1902	2.4192	33.3611	10.5750	1.9902	2.1119	1.3040	1.4404	15.2320	13.7901
21	4.7835	0.4000	0.6378	2.2937	2.4898	36.8609	10.8536	2.0937	2.1709	1.3640	1.4307	16.0705	14.8048
22	4.9666	0.4000	0.6622	2.4032	2.5634	40.7756	11.1466	2.2032	2.2323	1.4271	1.5222	16.9672	15.9068
23	5.1586	0.4000	0.6878	2.5186	2.6400	45.1444	11.4538	2.3186	2.2961	1.4930	1.5549	17.9244	17.1002
24	5.3597	0.4000	0.7146	2.6402	2.7195	50.0171	11.7755	2.4402	2.3622	1.5619	1.6088	18.9444	18.3920
25	5.5697	0.4000	0.7426	2.7678	2.8019	55.4385	12.1115	2.5678	2.4306	1.6337	1.6538	20.0298	19.7860
26	5.7888	0.4000	0.7718	2.9017	2.8871	61.4671	12.4621	2.7017	2.5012	1.7084	1.6998	21.1831	21.2903

Lanjutan tabel 4.5 Eksentrisitas atas dan bawah, kern atas dan bawah, modulus penampang atas dan bawah tiap segmen tumpuan A - D

No nodal	h (m)	tf (m)	tb (m)	ct (m)	cb (m)	I total (m^4)	Ac (m^2)	et (m)	eb (m)	kt (m)	kb (m)	Zt (m)	Zb (m)
27	6.0168	0.4000	0.8022	3.0416	2.9752	68.1540	12.8269	2.8416	2.5741	1.7859	1.7469	22.4073	22.9074
28	6.2539	0.4000	0.8339	3.1877	3.0662	75.5663	13.2062	2.9877	2.6493	1.8662	1.7950	23.7056	24.6449
29	6.5000	0.4000	0.8667	3.3401	3.1599	83.7706	13.6000	3.1401	2.7266	1.9493	1.8441	25.0803	26.5105
30	6.2539	0.4000	0.8339	3.1877	3.0662	75.5663	13.2062	2.9877	2.6493	1.8662	1.7950	23.7056	24.6449
31	6.0168	0.4000	0.8022	3.0416	2.9752	68.1540	12.8269	2.8416	2.5741	1.7859	1.7469	22.4073	22.9074
32	5.7888	0.4000	0.7718	2.9017	2.8871	61.4671	12.4621	2.7017	2.5012	1.7084	1.6998	21.1831	21.2903
33	5.5697	0.4000	0.7426	2.7678	2.8019	55.4385	12.1115	2.5678	2.4306	1.6337	1.6538	20.0298	19.7860
34	5.3597	0.4000	0.7146	2.6402	2.7195	50.0171	11.7755	2.4402	2.3622	1.5619	1.6088	18.9444	18.3920
35	5.1586	0.4000	0.6878	2.5186	2.6400	45.1444	11.4538	2.3186	2.2961	1.4930	1.5649	17.9244	17.1002
36	4.9666	0.4000	0.6622	2.4032	2.5634	40.7756	11.1466	2.2032	2.2323	1.4271	1.5222	16.9672	15.9068
37	4.7835	0.4000	0.6378	2.2937	2.4898	36.8609	10.8536	2.0937	2.1709	1.3640	1.4807	16.0705	14.8048
38	4.6094	0.4000	0.6146	2.1902	2.4192	33.3611	10.5750	1.9902	2.1119	1.3040	1.4404	15.2320	13.7901
39	4.4443	0.4000	0.5926	2.0926	2.3517	30.2382	10.3109	1.8926	2.0554	1.2470	1.4014	14.4501	12.8580
40	4.2881	0.4000	0.5717	2.0009	2.2872	27.4552	10.0610	1.8009	2.0014	1.1931	1.3638	13.7214	12.0038
41	4.1409	0.4000	0.5521	1.9150	2.2259	24.9806	9.8254	1.7150	1.9499	1.1422	1.3277	13.0447	11.2227
42	4.0027	0.4000	0.5337	1.8349	2.1678	22.7864	9.6043	1.6349	1.9010	1.0944	1.2930	12.4183	10.5113
43	3.8734	0.4000	0.5165	1.7604	2.1130	20.8438	9.3974	1.5604	1.8548	1.0497	1.2600	11.8404	9.8646
44	3.7530	0.4000	0.5004	1.6915	2.0615	19.1295	9.2048	1.4915	1.8113	1.0081	1.2286	11.3092	9.2794
45	3.6415	0.4000	0.4855	1.6281	2.0134	17.6212	9.0264	1.4281	1.7707	0.9696	1.1991	10.8232	8.7520
46	3.5390	0.4000	0.4719	1.5702	1.9688	16.3002	8.8624	1.3702	1.7329	0.9342	1.1713	10.3810	8.2793
47	3.4455	0.4000	0.4594	1.5177	1.9278	15.1499	8.7128	1.3177	1.6981	0.9020	1.1457	9.9821	7.8586
48	3.3608	0.4000	0.4481	1.4705	1.8903	14.1518	8.5773	1.2705	1.6663	0.8728	1.1220	9.6238	7.4865
49	3.2851	0.4000	0.4380	1.4285	1.8566	13.2945	8.4562	1.2285	1.6376	0.8468	1.1006	9.3066	7.1607
50	3.2182	0.4000	0.4291	1.3915	1.8267	12.5636	8.3491	1.1915	1.6122	0.8238	1.0814	9.0288	6.8778
51	3.1603	0.4000	0.4214	1.3598	1.8005	11.9515	8.2565	1.1598	1.5898	0.8040	1.0645	8.7892	6.6379
52	3.1113	0.4000	0.4148	1.3330	1.7783	11.4481	8.1781	1.1330	1.5709	0.7872	1.0501	8.5882	6.4377

Lanjutan tabel 4.5 Eksentrisitas atas dan bawah, kern atas dan bawah, modulus penampang atas dan bawah tiap segmen tumpuan A - D

No nodal	h (m)	tf (m)	tb (m)	ct (m)	cb (m)	I total (m^4)	Ac (m^2)	et (m)	eb (m)	kt (m)	kb (m)	Zt (m)	Zb (m)
53	3.0713	0.4000	0.4095	1.3112	1.7601	11.0466	8.1141	1.1112	1.5554	0.7735	1.0383	8.4248	6.2761
54	3.0401	0.4000	0.4053	1.2942	1.7459	10.7397	8.0642	1.0942	1.5433	0.7628	1.0290	8.2983	6.1514
55	3.0178	0.4000	0.8339	1.2821	1.7357	9.6016	8.0285	1.0821	1.3188	0.6890	0.9328	7.4890	5.5318
56	3.0045	0.4000	0.8667	1.2749	1.7296	9.4287	8.0072	1.0749	1.2963	0.6808	0.9236	7.3956	5.4514
57	3.0000	0.4000	0.8339	1.2725	1.7275	9.4382	8.0000	1.0725	1.3106	0.6829	0.9271	7.4171	5.4635
58	3.0045	0.4000	0.8022	1.2749	1.7296	9.5307	8.0072	1.0749	1.3285	0.6882	0.9336	7.4756	5.5103
59	3.0178	0.4000	0.7718	1.2821	1.7357	9.7066	8.0285	1.0821	1.3498	0.6966	0.9430	7.5709	5.5923
60	3.0401	0.4000	0.7426	1.2942	1.7459	9.9706	8.0642	1.0942	1.3746	0.7082	0.9553	7.7041	5.7109
61	3.0713	0.4000	0.7146	1.3112	1.7601	10.3260	8.1141	1.1112	1.4028	0.7230	0.9706	7.8752	5.8667
62	3.1113	0.4000	0.6878	1.3330	1.7783	10.7775	8.1781	1.1330	1.4344	0.7411	0.9886	8.0851	6.0606
63	3.1603	0.4000	0.6622	1.3598	1.8005	11.3340	8.2565	1.1598	1.4694	0.7624	1.0095	8.3350	6.2949
64	3.2182	0.4000	0.6378	1.3915	1.8267	12.0024	8.3491	1.1915	1.5078	0.7870	1.0331	8.6255	6.5705
65	3.2851	0.4000	0.6146	1.4285	1.8566	12.7952	8.4562	1.2285	1.5493	0.8150	1.0592	8.9571	6.8917
66	3.3608	0.4000	0.5926	1.4705	1.8903	13.7212	8.5773	1.2705	1.5940	0.8463	1.0879	9.3310	7.2587
67	3.4455	0.4000	0.5717	1.5177	1.9278	14.7958	8.7128	1.3177	1.6420	0.8809	1.1189	9.7488	7.6750
68	3.5390	0.4000	0.5521	1.5702	1.9688	16.0322	8.8624	1.3702	1.6928	0.9188	1.1521	10.2103	8.1431
69	3.6415	0.4000	0.5337	1.6281	2.0134	17.4500	9.0264	1.4281	1.7466	0.9602	1.1874	10.7180	8.6669
70	3.7530	0.4000	0.5165	1.6915	2.0615	19.0687	9.2048	1.4915	1.8033	1.0049	1.2247	11.2732	9.2499
71	3.8734	0.4000	0.5004	1.7604	2.1130	20.9087	9.3974	1.5604	1.8628	1.0530	1.2639	11.8772	9.8953
72	4.0027	0.4000	0.4855	1.8349	2.1678	22.9938	9.6043	1.6349	1.9251	1.1044	1.3048	12.5314	10.6070
73	4.1409	0.4000	0.4719	1.9150	2.2259	25.3495	9.8254	1.7150	1.9900	1.1591	1.3473	13.2373	11.3884
74	4.2881	0.4000	0.4594	2.0009	2.2872	28.0078	10.0610	1.8009	2.0575	1.2171	1.3913	13.9976	12.2455
75	4.4443	0.4000	0.4481	2.0926	2.3517	31.0001	10.3109	1.8926	2.1277	1.2785	1.4367	14.8142	13.1820
76	4.6094	0.4000	0.4380	2.1902	2.4192	34.3582	10.5750	1.9902	2.2002	1.3430	1.4834	15.6872	14.2023
77	4.7835	0.4000	0.4291	2.2937	2.4898	38.1241	10.8536	2.0937	2.2753	1.4108	1.5314	16.6212	15.3121
78	4.9666	0.4000	0.4214	2.4032	2.5634	42.3400	11.1466	2.2032	2.3527	1.4818	1.5806	17.6182	16.5171

Lanjutan tabel 4.5 Eksentrisitas atas dan bawah, kern atas dan bawah, modulus penampang atas dan bawah tiap segmen tumpuan A - D

No nodal	h (m)	tf (m)	tb (m)	ct (m)	cb (m)	I total (m^4)	Ac (m^2)	et (m)	eb (m)	kt (m)	kb (m)	Zt (m)	Zb (m)
79	5.1586	0.4000	0.4148	2.5186	2.6400	47.0458	11.4538	2.3186	2.4326	1.5558	1.6308	18.6793	17.8204
80	5.3597	0.4000	0.4095	2.6402	2.7195	52.2997	11.7755	2.4402	2.5148	1.6332	1.6822	19.8090	19.2314
81	5.5697	0.4000	0.4053	2.7678	2.8019	58.1445	12.1115	2.5678	2.5993	1.7134	1.7345	21.0075	20.7518
82	5.7888	0.4000	0.7718	2.9017	2.8871	61.4671	12.4621	2.7017	2.5012	1.7084	1.6998	21.1831	21.2903
83	6.0168	0.4000	0.8022	3.0416	2.9752	68.1540	12.8269	2.8416	2.5741	1.7859	1.7469	22.4073	22.9074
84	6.2539	0.4000	0.8339	3.1877	3.0662	75.5663	13.2062	2.9877	2.6493	1.8662	1.7950	23.7056	24.6449
85	6.5000	0.4000	0.8667	3.3401	3.1599	83.7706	13.6000	3.1401	2.7266	1.9493	1.8441	25.0803	26.5105
86	6.2539	0.4000	0.8339	3.1877	3.0662	75.5663	13.2062	2.9877	2.6493	1.8662	1.7950	23.7056	24.6449
87	6.0168	0.4000	0.8022	3.0416	2.9752	68.1540	12.8269	2.8416	2.5741	1.7859	1.7469	22.4073	22.9074
88	5.7888	0.4000	0.7718	2.9017	2.8871	61.4671	12.4621	2.7017	2.5012	1.7084	1.6998	21.1831	21.2903
89	5.5697	0.4000	0.7426	2.7678	2.8019	55.4385	12.1115	2.5678	2.4306	1.6337	1.6538	20.0298	19.7860
90	5.3597	0.4000	0.7146	2.6402	2.7195	50.0171	11.7755	2.4402	2.3622	1.5619	1.6088	18.9444	18.3920
91	5.1586	0.4000	0.6878	2.5186	2.6400	45.1444	11.4538	2.3186	2.2961	1.4930	1.5649	17.9244	17.1002
92	4.9666	0.4000	0.6622	2.4032	2.5634	40.7756	11.1466	2.2032	2.2323	1.4271	1.5222	16.9672	15.9068
93	4.7835	0.4000	0.6378	2.2937	2.4898	36.8609	10.8536	2.0937	2.1709	1.3640	1.4807	16.0705	14.8048
94	4.6094	0.4000	0.6146	2.1902	2.4192	33.3611	10.5750	1.9902	2.1119	1.3040	1.4404	15.2320	13.7901
95	4.4443	0.4000	0.5926	2.0926	2.3517	30.2382	10.3109	1.8926	2.0554	1.2470	1.4014	14.4501	12.8580
96	4.2881	0.4000	0.5717	2.0009	2.2872	27.4552	10.0610	1.8009	2.0014	1.1931	1.3638	13.7214	12.0038
97	4.1409	0.4000	0.5521	1.9150	2.2259	24.9806	9.8254	1.7150	1.9499	1.1422	1.3277	13.0447	11.2227
98	4.0027	0.4000	0.5337	1.8349	2.1678	22.7864	9.6043	1.6349	1.9010	1.0944	1.2930	12.4183	10.5113
99	3.8734	0.4000	0.5165	1.7604	2.1130	20.8438	9.3974	1.5604	1.8548	1.0497	1.2600	11.8404	9.8646
100	3.7530	0.4000	0.5004	1.6915	2.0615	19.1295	9.2048	1.4915	1.8113	1.0081	1.2286	11.3092	9.2794
101	3.6415	0.4000	0.4855	1.6281	2.0134	17.6212	9.0264	1.4281	1.7707	0.9696	1.1991	10.8232	8.7520
102	3.5390	0.4000	0.4719	1.5702	1.9688	16.3002	8.8624	1.3702	1.7329	0.9342	1.1713	10.3810	8.2793
103	3.4455	0.4000	0.4594	1.5177	1.9278	15.1499	8.7128	1.3177	1.6981	0.9020	1.1457	9.9821	7.8586
104	3.3608	0.4000	0.4481	1.4705	1.8903	14.1518	8.5773	1.2705	1.6663	0.8728	1.1220	9.6238	7.4865

Lanjutan tabel 4.5 Eksentrisitas atas dan bawah, kern atas dan bawah, modulus penampang atas dan bawah tiap segmen tumpuan A - D

No nodal	h (m)	tf (m)	tb (m)	ct (m)	cb (m)	I total (m^4)	Ac (m^2)	et (m)	eb (m)	kt (m)	kb (m)	Zt (m)	Zb (m)
105	3.2851	0.4000	0.4380	1.4285	1.8566	13.2945	8.4562	1.2285	1.6376	0.8468	1.1006	9.3066	7.1607
106	3.2182	0.4000	0.4291	1.3915	1.8267	12.5636	8.3491	1.1915	1.6122	0.8238	1.0814	9.0288	6.8778
107	3.1603	0.4000	0.4214	1.3598	1.8005	11.9515	8.2565	1.1598	1.5898	0.8040	1.0645	8.7892	6.6379
108	3.1113	0.4000	0.4148	1.3330	1.7783	11.4481	8.1781	1.1330	1.5709	0.7872	1.0501	8.5882	6.4377
109	3.0713	0.4000	0.4095	1.3112	1.7601	11.0466	8.1141	1.1112	1.5554	0.7735	1.0383	8.4248	6.2761
110	3.0401	0.4000	0.4053	1.2942	1.7459	10.7397	8.0642	1.0942	1.5433	0.7628	1.0290	8.2983	6.1514
111	3.0178	0.4000	0.4024	1.2821	1.7357	10.5233	8.0285	1.0821	1.5345	0.7552	1.0223	8.2079	6.0629
112	3.0045	0.4000	0.4006	1.2749	1.7296	10.3956	8.0072	1.0749	1.5293	0.7506	1.0183	8.1541	6.0104
113	3.0000	0.4000	0.4000	1.2725	1.7275	10.3526	8.0000	1.0725	1.5275	0.7491	1.0170	8.1356	5.9928

4.8 Perhitungan Momen Saat Pelaksanaan Tiap Segmen Tumpuan A - D

Pada saat pelaksanaan momen yang bekerja diakibatkan oleh beban berat sendiri dari gelagar dan *voorbouw wagen* yaitu alat yang digunakan sebagai tempat penyetelan *bekisting*, pembesian dan pengecoran segmen-segmen jembatan tanpa menggunakan perancah. Alat ini terbuat dari rangka baja yang dilengkapi dengan roda-roda agar dapat bergerak kedepan/kebelakang, dan ditaksir mempunyai berat sebesar 40 ton.

Pada perencanaan gelagar jembatan dalam tugas akhir ini, pelaksanaan pembuatan gelagar bentang B – C digunakan alat *voorbouw wagen*, sedangkan pelaksanaan pembuatan gelagar untuk bentang A – B dan C – D menggunakan perancah. Pada saat pelaksanaan gelagar bentang B – C dianggap sebagai batang kantilever dengan peninjauan tiap segmen dari tumpuan B atau C. Untuk menghitung momen yang terjadi pada tiap segmen (2,5 m) menggunakan program SAP 90. Hasil perhitungan momen saat pelaksanaan dapat dilihat pada tabel 4.6 sebagai berikut ;

Tabel 4.6 Momen saat pelaksanaan tiap segmen tumpuan A - D

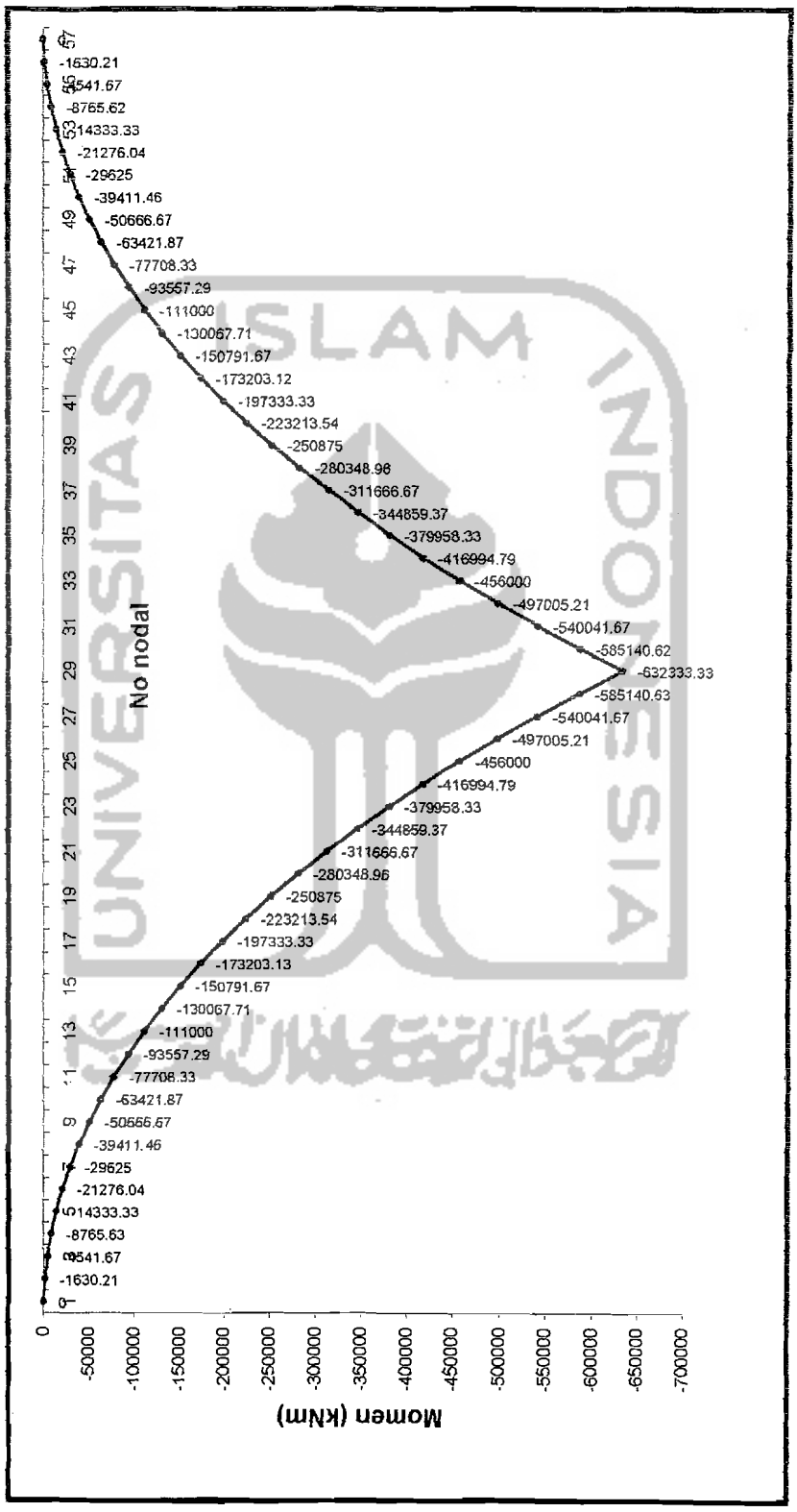
No nodal	Jarak (m)	Momen akibat BS (kNm)	Momen akibat Voorbouw wagen (kNm)	Momen total (kNm)
1	0.0	0.0000	0.0000	0.0000
2	2.5	-630.2100	-1000.0000	-1630.2100
3	5.0	-2541.6700	-2000.0000	-4541.6700
4	7.5	-5765.6200	-3000.0000	-8765.6200
5	10.0	-10333.3300	-4000.0000	-14333.3300
6	12.5	-16276.0400	-5000.0000	-21276.0400
7	15.0	-23625.0000	-6000.0000	-29625.0000
8	17.5	-32411.4600	-7000.0000	-39411.4600
9	20.0	-42666.6700	-8000.0000	-50666.6700
10	22.5	-54421.8700	-9000.0000	-63421.8700
11	25.0	-67708.3300	-10000.0000	-77708.3300
12	27.5	-82557.2900	-11000.0000	-93557.2900
13	30.0	-99000.0000	-12000.0000	-111000.0000
14	32.5	-117067.7100	-13000.0000	-130067.7100
15	35.0	-136791.6700	-14000.0000	-150791.6700
16	37.5	-158203.1200	-15000.0000	-173203.1200
17	40.0	-181333.3300	-16000.0000	-197333.3300
18	42.5	-206213.5400	-17000.0000	-223213.5400
19	45.0	-232875.0000	-18000.0000	-250875.0000
20	47.5	-261348.9600	-19000.0000	-280348.9600
21	50.0	-291666.6700	-20000.0000	-311666.6700
22	52.5	-323859.3700	-21000.0000	-344859.3700
23	55.0	-357958.3300	-22000.0000	-379958.3300
24	57.5	-393994.7900	-23000.0000	-416994.7900
25	60.0	-432000.0000	-24000.0000	-456000.0000
26	62.5	-472005.2100	-25000.0000	-497005.2100
27	65.0	-514041.6700	-26000.0000	-540041.6700
28	67.5	-558140.6200	-27000.0000	-585140.6200
29	70.0	-604333.3300	-28000.0000	-632333.3300
30	72.5	-558140.6300	-27000.0000	-585140.6300
31	75.0	-514041.6700	-26000.0000	-540041.6700
32	77.5	-472005.2100	-25000.0000	-497005.2100
33	80.0	-432000.0000	-24000.0000	-456000.0000
34	82.5	-393994.7900	-23000.0000	-416994.7900
35	85.0	-357958.3300	-22000.0000	-379958.3300
36	87.5	-323859.3800	-21000.0000	-344859.3800
37	90.0	-291666.6700	-20000.0000	-311666.6700
38	92.5	-261348.9600	-19000.0000	-280348.9600
39	95.0	-232875.0000	-18000.0000	-250875.0000
40	97.5	-206213.5400	-17000.0000	-223213.5400

Lanjutan tabel 4.6 Momen saat pelaksanaan tiap segmen tumpuan A - D

No nodal	Jarak (m)	Momen akibat BS (kNm)	Momen akibat Voorbouw wagen (kNm)	Momen total (kNm)
41	100.0	-181333.3300	-16000.0000	-197333.3300
42	102.5	-158203.1300	-15000.0000	-173203.1300
43	105.0	-136791.6700	-14000.0000	-150791.6700
44	107.5	-117067.7100	-13000.0000	-130067.7100
45	110.0	-99000.0000	-12000.0000	-111000.0000
46	112.5	-82557.2900	-11000.0000	-93557.2900
47	115.0	-67708.3300	-10000.0000	-77708.3300
48	117.5	-54421.8800	-9000.0000	-63421.8800
49	120.0	-42666.6700	-8000.0000	-50666.6700
50	122.5	-32411.4600	-7000.0000	-39411.4600
51	125.0	-23625.0000	-6000.0000	-29625.0000
52	127.5	-16276.0400	-5000.0000	-21276.0400
53	130.0	-10333.3300	-4000.0000	-14333.3300
54	132.5	-5765.6300	-3000.0000	-8765.6300
55	135.0	-2541.6700	-2000.0000	-4541.6700
56	137.5	-630.2100	-1000.0000	-1630.2100
57	140.0	0.0000	0.0000	0.0000
58	142.5	-630.2100	-1000.0000	-1630.2100
59	145.0	-2541.6700	-2000.0000	-4541.6700
60	147.5	-5765.6200	-3000.0000	-8765.6200
61	150.0	-10333.3300	-4000.0000	-14333.3300
62	152.5	-16276.0400	-5000.0000	-21276.0400
63	155.0	-23625.0000	-6000.0000	-29625.0000
64	157.5	-32411.4600	-7000.0000	-39411.4600
65	160.0	-42666.6700	-8000.0000	-50666.6700
66	162.5	-54421.8700	-9000.0000	-63421.8700
67	165.0	-67708.3300	-10000.0000	-77708.3300
68	167.5	-82557.2900	-11000.0000	-93557.2900
69	170.0	-99000.0000	-12000.0000	-111000.0000
70	172.5	-117067.7100	-13000.0000	-130067.7100
71	175.0	-136791.6700	-14000.0000	-150791.6700
72	177.5	-158203.1200	-15000.0000	-173203.1200
73	180.0	-181333.3300	-16000.0000	-197333.3300
74	182.5	-206213.5400	-17000.0000	-223213.5400
75	185.0	-232875.0000	-18000.0000	-250875.0000
76	187.5	-261348.9600	-19000.0000	-280348.9600
77	190.0	-291666.6700	-20000.0000	-311666.6700
78	192.5	-323859.3700	-21000.0000	-344859.3700
79	195.0	-357958.3300	-22000.0000	-379958.3300
80	197.5	-393994.7900	-23000.0000	-416994.7900

Lanjutan tabel 4.6 Momen saat pelaksanaan tiap segmen tumpuan A - D

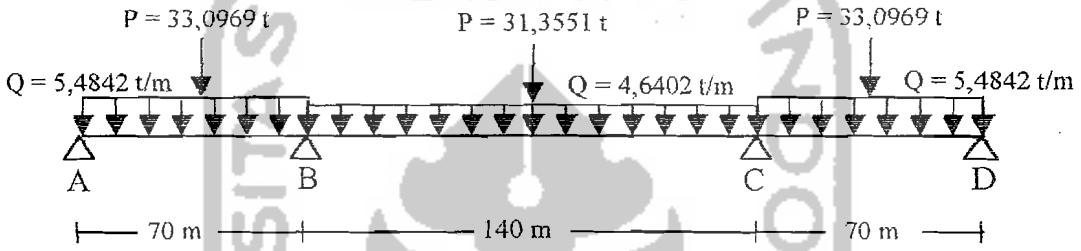
No nodal	Jarak (m)	Momen akibat BS (kNm)	Momen akibat Voorbouw wagen (kNm)	Momen total (kNm)
81	200.0	-432000.0000	-24000.0000	-456000.0000
82	202.5	-472005.2100	-25000.0000	-497005.2100
83	205.0	-514041.6700	-26000.0000	-540041.6700
84	207.5	-558140.6200	-27000.0000	-585140.6200
85	210.0	-604333.3300	-28000.0000	-632333.3300
86	212.5	-558140.6300	-27000.0000	-585140.6300
87	215.0	-514041.6700	-26000.0000	-540041.6700
88	217.5	-472005.2100	-25000.0000	-497005.2100
89	220.0	-432000.0000	-24000.0000	-456000.0000
90	222.5	-393994.7900	-23000.0000	-416994.7900
91	225.0	-357958.3300	-22000.0000	-379958.3300
92	227.5	-323859.3800	-21000.0000	-344859.3800
93	230.0	-291666.6700	-20000.0000	-311666.6700
94	232.5	-261348.9600	-19000.0000	-280348.9600
95	235.0	-232875.0000	-18000.0000	-250875.0000
96	237.5	-206213.5400	-17000.0000	-223213.5400
97	240.0	-181333.3300	-16000.0000	-197333.3300
98	242.5	-158203.1300	-15000.0000	-173203.1300
99	245.0	-136791.6700	-14000.0000	-150791.6700
100	247.5	-117067.7100	-13000.0000	-130067.7100
101	250.0	-99000.0000	-12000.0000	-111000.0000
102	252.5	-82557.2900	-11000.0000	-93557.2900
103	255.0	-67708.3300	-10000.0000	-77708.3300
104	257.5	-54421.8800	-9000.0000	-63421.8800
105	260.0	-42666.6700	-8000.0000	-50666.6700
106	262.5	-32411.4600	-7000.0000	-39411.4600
107	265.0	-23625.0000	-6000.0000	-29625.0000
108	267.5	-16276.0400	-5000.0000	-21276.0400
109	270.0	-10333.3300	-4000.0000	-14333.3300
110	272.5	-5765.6300	-3000.0000	-8765.6300
111	275.0	-2541.6700	-2000.0000	-4541.6700
112	277.5	-630.2100	-1000.0000	-1630.2100
113	280.0	0.0000	0.0000	0.0000



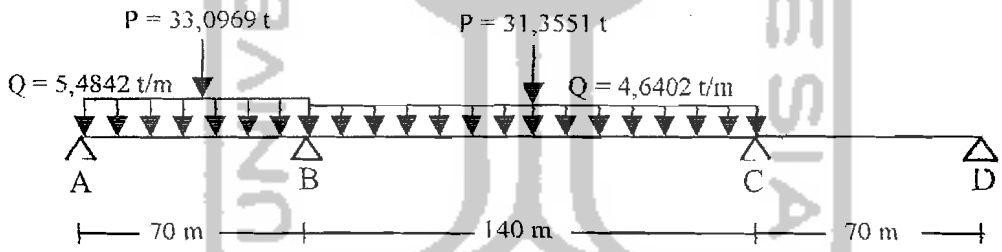
Gambar 4.5 Grafik hubungan antara Momen saat pelaksanaan dan No nodal

4.9 Perhitungan Momen Saat Servise Tiap Segmen Tumpuan A - D

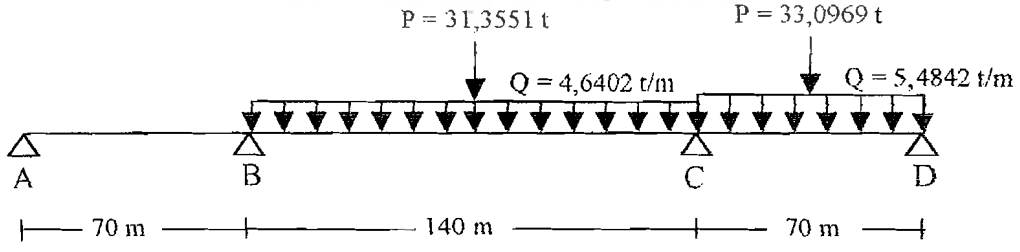
Dalam perhitungan momen saat servise, beban-beban yang diperhitungkan diakibatkan oleh berat sendiri gelagar, beban mati, beban hidup. Sehingga diperoleh momen-momen yaitu momen akibat berat sendiri gelagar, momen akibat beban mati dan momen akibat beban hidup dengan berbagai kombinasi. Adapun kombinasi beban hidup dapat dilihat pada gambar sebagai berikut ;



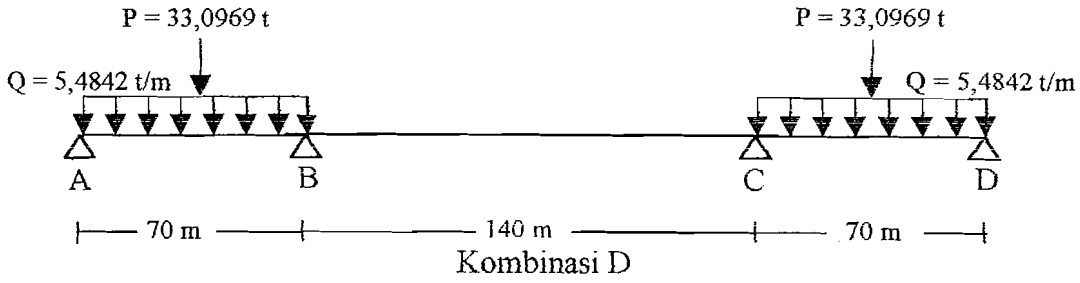
Kombinasi A



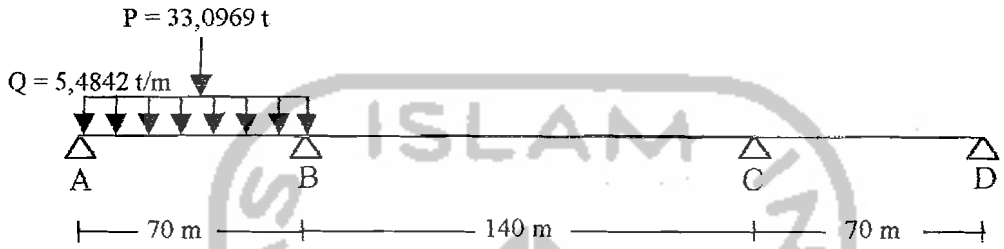
Kombinasi B



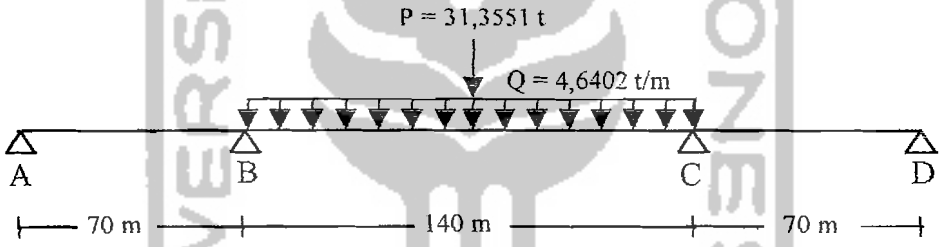
Kombinasi C



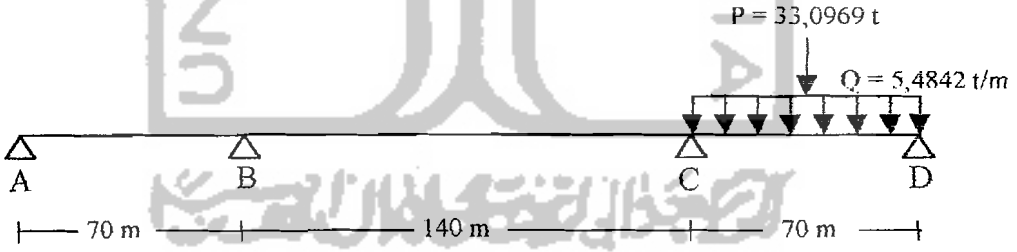
Kombinasi D



Kombinasi E



Kombinasi F



Kombinasi G

Dari momen-momen tersebut dihasilkan momen maks dan momen min. Untuk menghitung momen yang terjadi pada tiap segmen menggunakan program SAP 90. Hasil perhitungan momen saat servise dapat dilihat pada tabel 4.7

Tabel 4.7 Momen saat servise tiap momen tumpuan A - D

No nodal	Jarak (m)	Momen BS Gelagar (kNm)	Momen Beban Mati (kNm)	Momen Akibat Beban Hidup							Momen Maks (kNm)	Momen Min (kNm)
				Posisi A (kNm)	Posisi B (kNm)	Posisi C (kNm)	Posisi D (kNm)	Posisi E (kNm)	Posisi F (kNm)	Posisi G (kNm)		
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	2.5	4909.2100	498.0800	1798.8800	1505.4200	-2665.8300	4758.1800	4464.7100	-2959.2900	293.4600	10165.4700	2448.0000
3	5.0	8537.1600	845.4100	3254.9300	2668.0100	-5331.6600	9173.5200	8586.5900	-5918.5900	586.9300	18556.0900	3463.9800
4	7.5	10852.6200	1041.9900	4368.1500	3487.7700	-7997.4900	13246.0300	12365.6500	-8877.8800	880.3900	25140.6400	3016.7300
5	10.0	11824.3200	1087.8200	5138.5400	3964.3900	-10663.3200	16975.7200	15801.8600	-11837.1700	1173.8500	29887.8600	1074.9700
6	12.5	11421.0300	982.9000	5566.1000	4098.7900	-13329.1500	20362.5700	18895.2500	-14796.4700	1467.3200	32766.5000	-2392.5400
7	15.0	9611.4800	727.2300	5650.8300	3890.0500	-15994.9800	23406.5900	21645.8100	-17755.7600	1760.7800	33745.3000	-7417.0500
8	17.5	6364.4400	320.8100	5392.7200	3338.4800	-18660.8100	26107.7800	24053.5400	-20715.0500	2054.2400	32793.0300	-14029.8000
9	20.0	1648.6500	-236.3700	4791.7900	2444.0800	-21326.6400	28466.1300	26118.4300	-23674.3500	2347.7000	29878.4100	-22262.0700
10	22.5	-4567.1500	-944.2900	3848.0200	1206.8500	-23992.4700	30481.6600	27840.4900	-26633.6400	2641.1700	24970.2200	-32145.0800
11	25.0	-12314.1900	-1802.9600	2561.4200	-373.1200	-26658.3000	32154.3600	29219.7200	-29592.9300	2934.6300	18037.2100	-43710.0800
12	27.5	-21623.7400	-2812.3800	931.9900	-2296.1000	-29324.1300	33484.2200	30256.1300	-32552.2300	3228.0900	9048.1000	-56988.3500
13	30.0	-32527.0300	-3972.5500	-1040.2700	-4561.8200	-31989.9600	34471.2500	30949.6900	-35511.5200	3521.5600	-2028.3300	-72011.1000
14	32.5	-45055.3300	-5283.4700	-3355.3600	-7170.3800	-34655.7900	35115.4500	31300.4300	-38470.8100	3815.0200	-15223.3500	-88809.6100
15	35.0	-59239.8700	-6745.1400	-6013.2800	-10121.7700	-37321.6200	35416.8200	31308.3400	-41430.1100	4108.4800	-30568.1900	-107415.1200
16	37.5	-75111.9100	-8357.5600	-9841.4600	-14243.4100	-39987.4500	34547.9400	30145.9900	-44389.4000	4401.9500	-48921.5300	-127858.8700
17	40.0	-92702.7100	-10120.7300	-14012.4700	-18707.8800	-42653.2800	33336.2200	28640.8100	-47348.6900	4695.4100	-69487.2200	-150172.1300
18	42.5	-112043.5000	-12034.6500	-18526.3100	-23515.1800	-45319.1100	31781.6800	26792.8100	-50307.9900	4988.8700	-92296.4700	-174386.1400
19	45.0	-133165.5500	-14099.3200	-23382.9800	-28665.3100	-47984.9400	29884.3000	24601.9600	-53267.2800	5282.3300	-117380.5700	-200532.1500
20	47.5	-156100.0900	-16314.7400	-28582.4800	-34158.2800	-50650.7700	27644.0900	22068.2900	-56226.5700	5575.8000	-144770.7400	-228641.4000
21	50.0	-180878.3900	-18680.9100	-34124.8100	-39994.0800	-53316.6000	25061.0500	19191.7900	-59185.8700	5869.2600	-174498.2500	-258745.1700
22	52.5	-207531.6800	-21197.8300	-40009.9800	-46172.7000	-55982.4300	22135.1800	15972.4600	-62145.1600	6162.7200	-206594.3300	-290874.6700
23	55.0	-236091.2200	-23865.5000	-46237.9700	-52694.1600	-58648.2600	18866.4800	12410.2900	-65104.4500	6456.1900	-241090.2400	-325061.1700
24	57.5	-266588.2700	-26683.9300	-52808.8000	-59558.4500	-61314.0900	15254.9400	8505.2900	-68063.7400	6749.6500	-278017.2600	-361335.9400
25	60.0	-299054.0600	-29653.1000	-59722.4600	-66765.5700	-63979.9200	11300.5800	4257.4600	-71023.0400	7043.1100	-317406.5800	-399730.2000
26	62.5	-333519.8600	-32773.0200	-66978.9500	-74315.5300	-66645.7600	7003.3800	-333.1900	-73982.3300	7336.5800	-355836.3800	-440608.4100

Lanjutan tabel 4.7 Momen saat servise tiap momen tumpuan A - D

No nodal	Jarak (m)	Momen BS Gelagar (kNm)	Momen Beban Mati (kNm)	Momen Akibat Beban Hidup							Momen Maks (kNm)	Momen Min (kNm)
				Posisi A (kNm)	Posisi B (kNm)	Posisi C (kNm)	Posisi D (kNm)	Posisi E (kNm)	Posisi F (kNm)	Posisi G (kNm)		
27	65.0	-370016.9000	-36043.6900	-74578.2700	-82208.3100	-69311.5900	2363.3500	-5266.6900	-76941.6200	7630.0400	-395159.8800	-488268.9000
28	67.5	-408576.4500	-39465.1100	-82520.4200	-90443.9300	-71977.4200	-2619.5000	-10543.0100	-79900.9200	7923.5000	-436696.6400	-538485.4900
29	70.0	-449229.7400	-43037.2800	-90805.4100	-99022.3700	-74643.2500	-7945.1900	-16162.1600	-82860.2100	8216.9700	-480477.8800	-591289.3900
30	72.5	-403037.0300	-38891.6500	-82438.1200	-90219.7500	-66711.3000	-7945.1900	-15726.8200	-74492.9300	7781.6200	-438292.6900	-532148.4300
31	75.0	-358938.0700	-34896.7800	-74360.8500	-81707.1400	-59069.3800	-7945.1900	-15291.4800	-66415.6600	7346.2800	-390483.4400	-475541.9900
32	77.5	-316901.6100	-31052.6500	-66573.6000	-73484.5400	-51717.4600	-7945.1900	-14856.1400	-58628.4000	6910.9400	-344887.4500	-421438.8000
33	80.0	-276896.4100	-27359.2800	-59076.3500	-65551.9500	-44655.5600	-7945.1900	-14420.7900	-51131.1600	6475.6000	-301473.4600	-369807.6400
34	82.5	-238891.2000	-23816.6500	-51869.1200	-57909.3800	-37883.6700	-7945.1900	-13985.4500	-43923.9200	6040.2600	-260210.2200	-320617.2300
35	85.0	-202854.7400	-20424.7800	-44951.9000	-50556.8200	-31401.7900	-7945.1900	-13550.1100	-37006.7000	5604.9200	-221066.4700	-273836.3400
36	87.5	-168755.7800	-17183.6500	-38324.6900	-43494.2700	-25209.9200	-7945.1900	-13114.7700	-30379.5000	5169.5800	-184010.9800	-229433.7000
37	90.0	-136563.0700	-14093.2800	-31987.5000	-36721.7300	-19308.0700	-7945.1900	-12679.4300	-24042.3000	4734.2300	-149012.4900	-187378.0800
38	92.5	-106245.3700	-11153.6500	-25940.3100	-30239.2100	-13696.2300	-7945.1900	-12244.0900	-17995.1200	4298.8900	-116039.7600	-147638.2300
39	95.0	-77771.4100	-8364.7800	-20183.1400	-24046.8900	-8374.4000	-7945.1900	-11808.7400	-12237.9500	3863.5500	-85061.5100	-110182.8800
40	97.5	-51109.9500	-5726.6500	-14715.9900	-18144.2000	-3342.5800	-7945.1900	-11373.4000	-6770.7900	3428.2100	-56046.5200	-74980.8000
41	100.0	-26229.7400	-3239.2800	-9538.8400	-12531.7100	1399.2200	-7945.1900	-10938.0600	-1593.6500	2992.8700	-28963.5200	-42000.7300
42	102.5	-3099.5300	-902.6500	-4651.7100	-7209.2300	5851.0100	-7945.1900	-10502.7200	3293.4900	2557.5300	1848.8300	-14504.9000
43	105.0	18311.9300	1283.2200	-54.5900	-2176.7700	10012.7900	-7945.1900	-10067.3800	7890.6100	2122.1800	29607.9400	9527.7700
44	107.5	38035.8800	3318.3500	4252.5200	2565.6800	13884.5600	-7945.1900	-9632.0400	12197.7100	1686.8400	55238.7900	31722.1900
45	110.0	56103.5900	5202.7200	8269.6100	7018.1100	17466.3100	-7945.1900	-9196.7000	16214.8100	1251.5000	78772.6200	52109.6100
46	112.5	72546.3000	6936.3500	11996.7000	11180.5400	20758.0500	-7945.1900	-8761.3500	19941.8900	816.1600	100240.7000	70721.3000
47	115.0	87395.2600	8519.2200	15433.7700	15052.9500	23759.7800	-7945.1900	-8326.0100	23378.9600	380.8200	119674.2600	87588.4700
48	117.5	100681.7200	9951.3500	18580.8200	18635.3500	26471.4900	-7945.1900	-7890.6700	26526.0200	-54.5200	137159.0900	102687.8800
49	120.0	112436.9200	11232.7200	21437.8700	21927.7300	28893.2000	-7945.1900	-7455.3300	29383.0600	-489.8600	153052.7000	115724.4500
50	122.5	122692.1300	12363.3500	24004.9000	24930.1100	31024.8900	-7945.1900	-7019.9900	31950.0900	-925.2100	167005.5700	127110.2900
51	125.0	131478.5900	13343.2200	26281.9200	27642.4700	32866.5700	-7945.1900	-6584.6500	34227.1100	-1360.5500	179048.9200	136876.6200
52	127.5	138827.5500	14172.3500	28268.9300	30064.8200	34418.2300	-7945.1900	-6149.3000	36214.1200	-1795.8900	189214.0200	145054.7100

Lanjutan tabel 4.7 Momen saat servise tiap momen tumpuan A - D

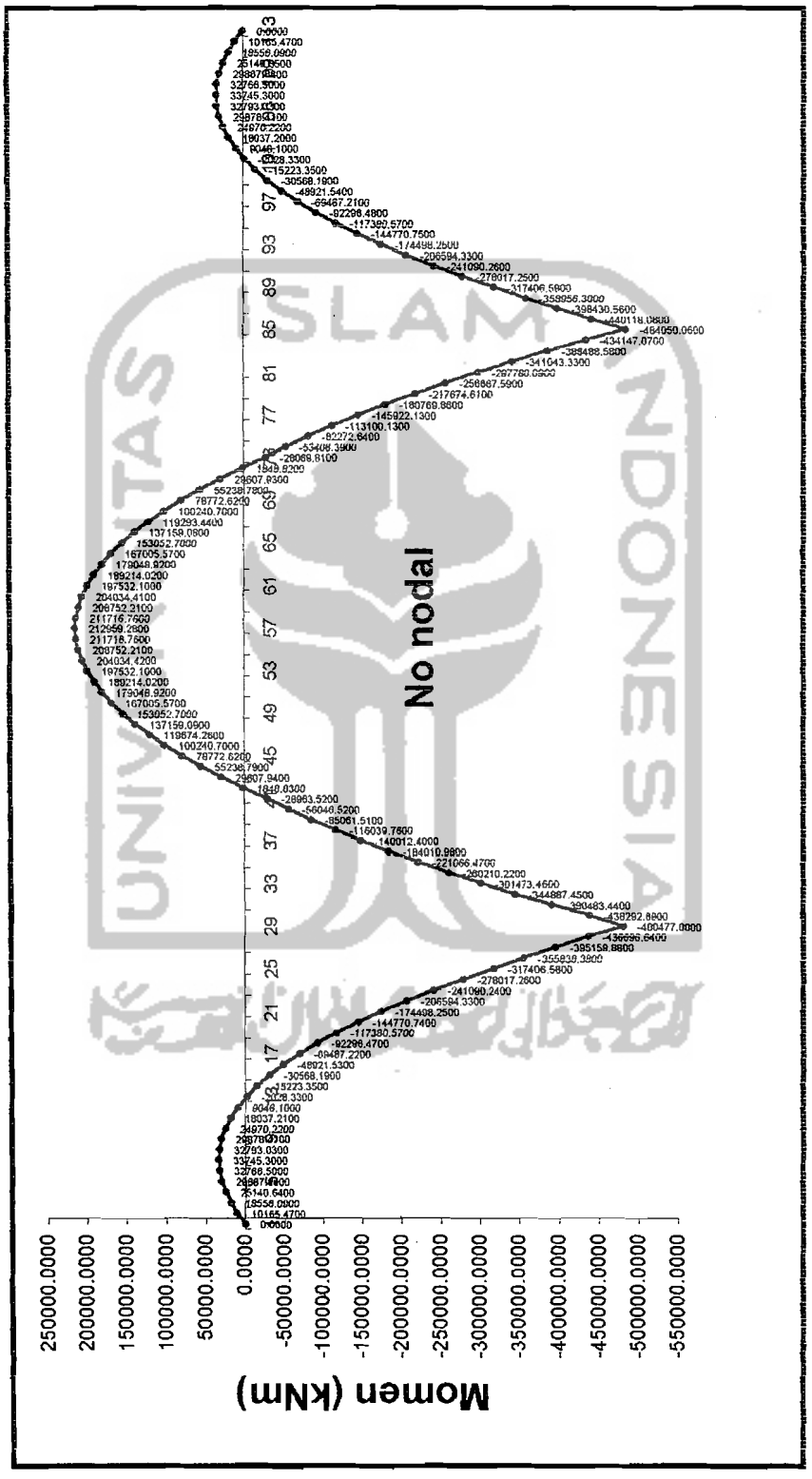
No nodal	Jarak (m)	Momen BS Gelagar (kNm)	Momen Beban Mati (kNm)	Momen Akibat Beban Hidup							Momen Maks (kNm)	Momen Min (kNm)
				Posisi A (kNm)	Posisi B (kNm)	Posisi C (kNm)	Posisi D (kNm)	Posisi E (kNm)	Posisi F (kNm)	Posisi G (kNm)		
53	130.0	144770.2600	14850.7200	29965.9200	32197.1500	35679.8900	-7945.1900	-5713.9600	37911.1200	-2231.2300	197532.1000	151675.7900
54	132.5	149337.9700	15378.3500	31372.9100	34039.4800	35651.5300	-7945.1900	-5278.6200	39318.1000	-2666.5700	204034.4200	156771.1300
55	135.0	152561.9200	15755.2200	32489.8800	35591.7900	37333.1600	-7945.1900	-4843.2800	40435.0700	-3101.9100	208752.2100	160371.9500
56	137.5	154473.3800	15981.3500	33316.8300	36854.0900	37724.7700	-7945.1900	-4407.9400	41262.0300	-3537.2500	211716.7600	162509.5400
57	140.0	155103.5900	16056.7200	33853.7800	37826.3700	37826.3800	-7945.1900	-3972.6000	41798.9700	-3972.6000	212959.2800	163215.1200
58	142.5	154473.3800	15981.3500	33316.8300	37724.7700	36854.0900	-7945.1900	-3537.2600	41262.0300	-4407.9400	211716.7600	162509.5400
59	145.0	152561.9200	15755.2200	32489.8800	37333.1600	35591.7900	-7945.1900	-3101.9100	40435.0700	-4843.2800	208752.2100	160371.9500
60	147.5	149337.9600	15378.3500	31372.9100	36651.5300	34039.4800	-7945.1900	-2666.5700	39318.1000	-5278.6200	204034.4100	156771.1200
61	150.0	144770.2600	14850.7200	29965.9200	35679.8900	32197.1500	-7945.1900	-2231.2300	37911.1200	-5713.9600	197532.1000	151675.7900
62	152.5	138827.5500	14172.3500	28268.9300	34418.2300	30064.8200	-7945.1900	-1795.8900	36214.1200	-6149.3000	189214.0200	145054.7100
63	155.0	131478.5900	13343.2200	26281.9200	32866.5700	27642.4700	-7945.1900	-1360.5500	34227.1100	-6584.6500	179048.9200	136876.6200
64	157.5	122692.1300	12363.3500	24004.9000	31024.8900	24930.1100	-7945.1900	-925.2100	31950.0900	-7019.9900	167005.5700	127110.2900
65	160.0	112436.9200	11232.7200	21437.8700	28893.2000	21927.7300	-7945.1900	-489.8600	29383.0600	-7455.3300	153052.7000	115724.4500
66	162.5	100681.7100	9951.3500	18580.8200	26471.4900	18635.3500	-7945.1900	-54.5200	26526.0200	-7890.6700	137159.0800	102687.8700
67	165.0	87395.2600	8519.2200	15433.7700	23759.7800	15052.9500	-7945.1900	380.8200	23378.9600	-8326.0100	119293.4400	87588.4700
68	167.5	72546.3000	6936.3500	11996.7000	20758.0500	11180.5400	-7945.1900	816.1600	19941.8900	-8761.3500	100240.7000	70721.3000
69	170.0	56103.5900	5202.7200	8269.6100	17466.3100	7018.1100	-7945.1900	1251.5000	16214.8100	-9196.6900	78772.6200	52109.6200
70	172.5	38035.8800	3318.3500	4252.5200	13884.5500	2565.6800	-7945.1900	1686.8400	12197.7100	-9632.0400	55238.7800	31722.1900
71	175.0	18311.9200	1283.2200	-54.5900	10012.7900	-2176.7700	-7945.1900	2122.1800	7890.6000	-10067.3800	29607.9300	9527.7600
72	177.5	-3099.5400	-902.6500	-4651.7100	5851.0100	-7209.2400	-7945.1900	2557.5300	3293.4800	-10502.7200	1848.8200	-14504.9100
73	180.0	-26229.7500	-3239.2800	-9538.8400	1399.2200	-12531.7100	-7945.1900	2992.8700	-1593.6500	-10938.0600	-28069.8100	-42000.7400
74	182.5	-51109.9500	-5726.6500	-14715.9900	-3342.3800	-18144.2000	-7945.1900	3428.2100	-6770.7900	-11373.4000	-53408.3900	-74980.8000
75	185.0	-77771.4100	-8364.7800	-20183.1400	-8374.4000	-24046.7000	-7945.1900	3863.5500	-12237.9500	-11808.7400	-82272.6400	-110182.8900
76	187.5	-106245.3700	-11153.6500	-25940.3100	-13696.2300	-30239.2100	-7945.1900	4298.8900	-17995.1200	-12244.0800	-113100.1300	-147638.2300
77	190.0	-136563.0800	-14093.2800	-31987.5000	-19308.0700	-36721.7300	-7945.1900	4734.2300	-24042.3000	-12679.4300	-145922.1300	-187378.0900
78	192.5	-168755.7900	-17183.6500	-38324.6900	-25209.9200	-43494.2700	-7945.1900	5169.5800	-30379.5000	-13114.7700	-180769.8600	-229433.7100

Lanjutan tabel 4.7 Momen saat servise tiap momen tumpuan A - D

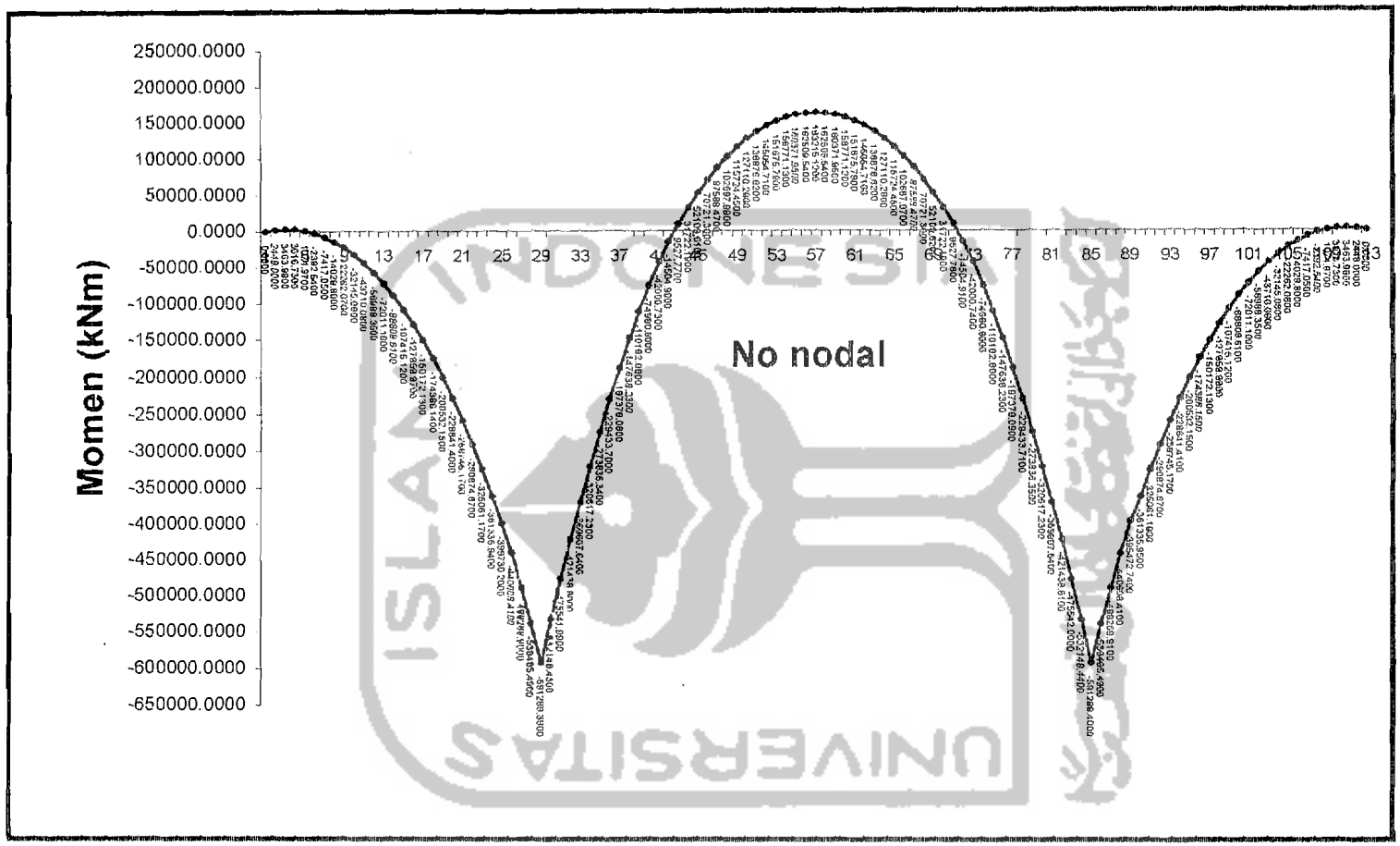
No nodal	Jarak (m)	Momen BS Gelagar (kNm)	Momen Beban Mati (kNm)	Momen Akibat Beban Hidup							Momen Maks (kNm)	Momen Min (kNm)
				Posisi A (kNm)	Posisi B (kNm)	Posisi C (kNm)	Posisi D (kNm)	Posisi E (kNm)	Posisi F (kNm)	Posisi G (kNm)		
79	195.0	-202854.7500	-20424.7800	-44951.9000	-31401.7900	-50556.8200	-7945.1900	5604.9200	-37006.7100	-13550.1100	-217674.6100	-273836.3500
80	197.5	-238891.2000	-23816.6500	-51869.1200	-37883.6700	-57909.3800	-7945.1900	6040.2600	-43923.9300	-13985.4500	-256667.5900	-320617.2300
81	200.0	-276896.4100	-27359.2800	-59076.3500	-44655.5600	-65551.9500	-7945.1900	6475.6000	-51131.1600	-14420.7900	-297780.0900	-369807.6400
82	202.5	-316901.6200	-31052.6500	-66573.6000	-51717.4600	-73484.5400	-7945.1900	6910.9400	-58628.4000	-14856.1300	-341043.3300	-421438.8100
83	205.0	-358938.0800	-34896.7800	-74360.8500	-59069.3800	-81707.1400	-7945.1900	7346.2800	-66415.6600	-15291.4800	-386488.5800	-475542.0000
84	207.5	-403037.0400	-38891.6500	-82438.1200	-66711.3100	-90219.7500	-7945.1900	7781.6200	-74492.9300	-15726.8200	-434147.0700	-532148.4400
85	210.0	-449229.7500	-43037.2800	-90805.4100	-74643.2500	-99022.3700	-7945.1900	8216.9700	-82860.2200	-16162.1600	-484050.0600	-591289.4000
86	212.5	-408576.4500	-39465.1100	-82520.4200	-71977.4200	-90443.9300	-2619.5000	7923.5000	-79900.9200	-10543.0000	-440118.0600	-538485.4900
87	215.0	-370016.9100	-36043.6900	-74578.2700	-69311.5900	-82208.3100	2363.3600	7630.0400	-76941.6300	-5266.5800	-398430.5600	-488268.9100
88	217.5	-333519.8600	-32773.0200	-66978.9500	-66645.7600	-74315.5300	7003.3800	7336.5800	-73982.3300	-333.1900	-358956.3000	-440608.4100
89	220.0	-299054.0700	-29653.1000	-59722.4600	-63979.9300	-66765.5700	11300.5800	7043.1100	-71023.0400	4257.4700	-317406.5900	-399730.2100
90	222.5	-266588.2700	-26683.9300	-52808.8000	-61314.1000	-59558.4500	15254.9500	6749.6500	-68063.7500	8505.2900	-278017.2500	-361335.9500
91	225.0	-236091.2300	-23865.5100	-46237.9800	-58648.2700	-52694.1600	18866.4800	6456.1900	-65104.4500	12410.2900	-241090.2600	-325061.1900
92	227.5	-207531.6800	-21197.8300	-40009.9800	-55982.4400	-46172.7000	22135.1800	6162.7200	-62145.1600	15972.4600	-206594.3300	-290874.6700
93	230.0	-180878.3900	-18680.9100	-34124.8100	-53316.6100	-39994.0800	25061.0500	5869.2600	-59185.8700	19191.7900	-174498.2500	-258745.1700
94	232.5	-156100.1000	-16314.7400	-28582.4800	-50650.7800	-34158.2800	27644.0900	5575.8000	-56226.5700	22068.2900	-144770.7500	-228641.4100
95	235.0	-133165.5500	-14099.3200	-23382.9800	-47984.9500	-28665.3100	29884.3000	5282.3400	-53267.2800	24601.9700	-117380.5700	-200532.1500
96	237.5	-112043.5100	-12034.6500	-18526.3100	-45319.1200	-23515.1800	31781.6800	4988.8700	-50307.9900	26792.8100	-92296.4800	-174386.1500
97	240.0	-92702.7100	-10120.7300	-14012.4700	-42653.2800	-18707.8800	33336.2300	4695.4100	-47348.6900	28640.8200	-69487.2100	-150172.1300
98	242.5	-75111.9200	-8357.5600	-9841.4600	-39987.4500	-14243.4100	34547.9400	4401.9500	-44389.4000	30145.9900	-48921.5400	-127858.8800
99	245.0	-59239.8700	-6745.1400	-6013.2800	-37321.6200	-10121.7700	35416.8200	4108.4800	-41430.1100	31308.3400	-30568.1900	-107415.1200
100	247.5	-45055.3300	-5283.4700	-3355.3600	-34655.7900	-7170.3800	35115.4500	3815.0200	-38470.8100	31300.4300	-15223.3500	-88809.6100
101	250.0	-32527.0300	-3972.5500	-1040.2700	-31989.9600	-4561.8200	34471.2500	3521.5600	-35511.5200	30949.7000	-2028.3300	-72011.1000
102	252.5	-21623.7400	-2812.3800	931.9900	-29324.1300	-2296.1000	33484.2200	3228.0900	-32552.2300	30256.1300	9048.1000	-56988.3500
103	255.0	-12314.2000	-1802.9600	2561.4200	-26658.3000	-373.2100	32154.3600	2934.6300	-29592.9300	29219.7300	18037.2000	-43710.0900
104	257.5	-4567.1500	-944.2900	3848.0200	-23992.4700	1206.8500	30481.6600	2641.1700	-26633.6400	27840.4900	24970.2200	-32145.0800

Lanjutan tabel 4 7 Momen saat servise tiap momen tumpuan A - D

No nodal	Jarak (m)	Momen BS Gelagar (kNm)	Momen Beban Mati (kNm)	Momen Akibat Beban Hidup							Momen Maks (kNm)	Momen Min (kNm)
				Posisi A (kNm)	Posisi B (kNm)	Posisi C (kNm)	Posisi D (kNm)	Posisi E (kNm)	Posisi F (kNm)	Posisi G (kNm)		
105	260.0	1648.6400	-236.3700	4791.7900	-21326.6400	2444.0800	28466.1400	2347.7000	-23674.3500	26118.4300	29878.4100	-22262.0800
106	262.5	6364.4400	320.8100	5392.7200	-18660.8100	3338.4800	26107.7800	2054.2400	-20715.0500	24053.5400	32793.0300	-14029.8000
107	265.0	9611.4800	727.2300	5650.8300	-15994.9800	3890.0500	23406.5900	1760.7800	-17755.7600	21645.8100	33745.3000	-7417.0500
108	267.5	11421.0300	982.9000	5566.1000	-13329.1500	4098.7900	20362.5700	1467.3200	-14796.4700	18895.2500	32766.5000	-2392.5400
109	270.0	11824.3200	1087.8200	5138.5400	-10663.3200	3964.6900	16975.7200	1173.8500	-11837.1700	15801.6700	29887.8600	1074.9700
110	272.5	10852.6200	1041.9900	4368.1500	-7997.4900	3487.7700	13246.0400	880.3900	-8877.8800	12365.6500	25140.6500	3016.7300
111	275.0	8537.1600	845.4100	3254.9300	-5331.6600	2668.0100	9173.5200	586.9300	-5918.5900	8586.6000	18556.0900	3463.9800
112	277.5	4909.2100	498.0800	1798.8800	-2665.8300	1505.4200	4758.1800	293.4600	-2959.2900	4464.7100	10165.4700	2448.0000
113	280.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000



Grafik 4.6 Grafik hubungan antara Momen maks saat servise dengan No nodal



Grafik 4.7 Grafik hubungan antara Momen min saat servise dengan No nodal

4.10 Perhitungan Momen Rencana Tiap Segmen Tumpuan A - D

Setelah momen saat pelaksanaan dan saat servise didapatkan, kemudian dibandingkan dan dipilih yang terbesar sebagai momen dalam perencanaan selanjutnya. Hasil perhitungan momen rencana dapat dilihat pada tabel 4.8 sebagai berikut ;

Tabel 4.8 Momen rencana tiap segmen tumpuan A - D

No nodal	Jarak (m)	Momen Pelaksanaan (kNm)	Momen servise		Momen rencana	
			Maks (kNm)	Min (kNm)	Positip (kNm)	Negatip (kNm)
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000
2	2.5	-1630.2100	10165.4700	2448.0000	10165.4700	-1630.2100
3	5.0	-4541.6700	18556.0900	3463.9800	18556.0900	-4541.6700
4	7.5	-8765.6300	25140.6400	3016.7300	25140.6400	-8765.6300
5	10.0	-14333.3000	29887.8600	1074.9700	29887.8600	-14333.3000
6	12.5	-21276.0000	32766.5000	-2392.5400	32766.5000	-21276.0000
7	15.0	-29625.0000	33745.3000	-7417.0500	33745.3000	-29625.0000
8	17.5	-39411.5000	32793.0300	-14029.8000	32793.0300	-39411.5000
9	20.0	-50666.7000	29878.4100	-22262.0700	29878.4100	-50666.7000
10	22.5	-63421.9000	24970.2200	-32145.0800	24970.2200	-63421.9000
11	25.0	-77708.3000	18037.2100	-43710.0800	18037.2100	-77708.3000
12	27.5	-93557.3000	9048.1000	-56988.3500	9048.1000	-93557.3000
13	30.0	-111000.0000	-2028.3300	-72011.1000	-	-111000.0000
14	32.5	-130068.0000	-15223.3500	-88809.6100	-	-130068.0000
15	35.0	-150792.0000	-30568.1900	-107415.1000	-	-150792.0000
16	37.5	-173203.0000	-48921.5300	-127858.9000	-	-173203.0000
17	40.0	-197333.0000	-69487.2200	-150172.1000	-	-197333.0000
18	42.5	-223214.0000	-92296.4700	-174386.1000	-	-223214.0000
19	45.0	-250875.0000	-117380.6000	-200532.2000	-	-250875.0000
20	47.5	-280349.0000	-144770.7000	-228641.4000	-	-280349.0000
21	50.0	-311667.0000	-174498.3000	-258745.2000	-	-311667.0000
22	52.5	-344859.0000	-206594.3000	-290874.7000	-	-344859.0000
23	55.0	-379958.0000	-241090.2000	-325061.2000	-	-379958.0000
24	57.5	-416995.0000	-278017.3000	-361335.9000	-	-416995.0000
25	60.0	-456000.0000	-317406.6000	-399730.2000	-	-456000.0000
26	62.5	-497005.0000	-355836.4000	-440608.4000	-	497005.0000
27	65.0	-540042.0000	-395159.9000	-488268.9000	-	-540042.0000
28	67.5	-585141.0000	-436696.6000	-538485.5000	-	-585141.0000
29	70.0	-632333.0000	-480477.9000	-591289.4000	-	-632333.0000
30	72.5	-585141.0000	-438292.7000	-532148.4000	-	585141.0000
31	75.0	-540042.0000	-390483.4000	-475542.0000	-	-540042.0000
32	77.5	-497005.0000	-344887.5000	-421438.8000	-	-497005.0000
33	80.0	-456000.0000	-301473.5000	-369807.6000	-	-456000.0000
34	82.5	-416995.0000	-260210.2000	-320617.2000	-	-416995.0000
35	85.0	-379958.0000	-221066.5000	-273836.3000	-	-379958.0000
36	87.5	-344859.0000	-184011.0000	-229433.7000	-	-344859.0000
37	90.0	-311667.0000	-149012.5000	-187378.1000	-	-311667.0000
38	92.5	-280349.0000	-116039.8000	-147638.2000	-	-280349.0000
39	95.0	-250875.0000	-85061.5100	-110182.9000	-	-250875.0000
40	97.5	-223214.0000	-56046.5200	-74980.8000	-	-223214.0000

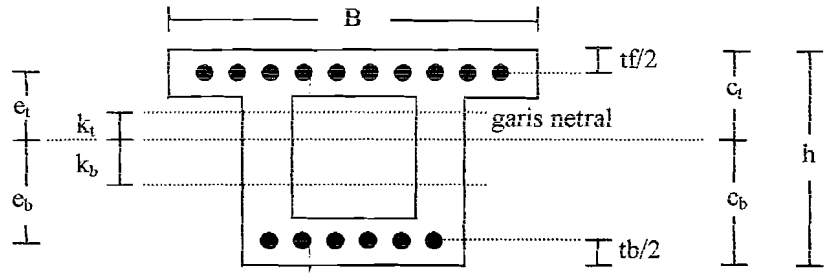
Lanjutan tabel 4.8 Momen rencana tiap segmen tumpuan A - D

No nodal	Jarak (m)	Momen Pelaksanaan (kNm)	Momen servise		Momen rencana	
			Maks (kNm)	Min (kNm)	Positip (kNm)	Negatip (kNm)
41	100.0	-197333.0000	-28963.5200	-42000.7300	-	-197333.0000
42	102.5	-173203.0000	1848.8300	-14504.9000	1848.8300	-173203.0000
43	105.0	-150792.0000	29607.9400	9527.7700	29607.9400	-150792.0000
44	107.5	-130068.0000	55238.7900	31722.1900	55238.7900	-130068.0000
45	110.0	-111000.0000	78772.6200	52109.6100	78772.6200	-111000.0000
46	112.5	-93557.3000	100240.7000	70721.3000	100240.7000	-93557.3000
47	115.0	-77708.3000	119674.3000	87588.4700	119674.3000	-77708.3000
48	117.5	-63421.9000	137159.1000	102687.8800	137159.1000	-63421.9000
49	120.0	-50666.7000	153052.7000	115724.4500	153052.7000	-50666.7000
50	122.5	-39411.5000	167005.6000	127110.2900	167005.6000	-39411.5000
51	125.0	-29625.0000	179048.9000	136876.6200	179048.9000	-29625.0000
52	127.5	-21276.0000	189214.0000	145054.7100	189214.0000	-21276.0000
53	130.0	-14333.3000	197532.1000	151675.7900	197532.1000	-14333.3000
54	132.5	-8765.6200	204034.4000	156771.1300	204034.4000	-8765.6200
55	135.0	-4541.6700	208752.2000	160371.9500	208752.2000	-4541.6700
56	137.5	-1630.2100	211716.8000	162509.5400	211716.8000	-1630.2100
57	140.0	0.0000	212959.3000	163215.1200	212959.3000	0.0000
58	142.5	-1630.2100	211716.8000	162509.5400	211716.8000	-1630.2100
59	145.0	-4541.6700	208752.2000	160371.9500	208752.2000	-4541.6700
60	147.5	-8765.6200	204034.4000	156771.1200	204034.4000	-8765.6200
61	150.0	-14333.3000	197532.1000	151675.7900	197532.1000	-14333.3000
62	152.5	-21276.0000	189214.0000	145054.7100	189214.0000	-21276.0000
63	155.0	-29625.0000	179048.9000	136876.6200	179048.9000	-29625.0000
64	157.5	-39411.5000	167005.6000	127110.2900	167005.6000	-39411.5000
65	160.0	-50666.7000	153052.7000	115724.4500	153052.7000	-50666.7000
66	162.5	-63421.9000	137159.1000	102687.8700	137159.1000	-63421.9000
67	165.0	-77708.3000	119293.4000	87588.4700	119293.4000	-77708.3000
68	167.5	-93557.3000	100240.7000	70721.3000	100240.7000	-93557.3000
69	170.0	-111000.0000	78772.6200	52109.6200	78772.6200	-111000.0000
70	172.5	-130068.0000	55238.7800	31722.1900	55238.7800	-130068.0000
71	175.0	-150792.0000	29607.9300	9527.7600	29607.9300	-150792.0000
72	177.5	-173203.0000	1848.8200	-14504.9100	1848.8200	-173203.0000
73	180.0	-197333.0000	-28069.8100	-42000.7400	-	-197333.0000
74	182.5	-223214.0000	-53408.3900	-74980.8000	-	-223214.0000
75	185.0	-250875.0000	-82272.6400	-110182.9000	-	-250875.0000
76	187.5	-280349.0000	-113100.1000	-147638.2000	-	-280349.0000
77	190.0	-311667.0000	-145922.1000	-187378.1000	-	-311667.0000
78	192.5	-344859.0000	-180769.9000	-229433.7000	-	-344859.0000
79	195.0	-379958.0000	-217674.6000	-273836.4000	-	-379958.0000
80	197.5	-416995.0000	-256667.6000	-320617.2000	-	-416995.0000

Lanjutan tabel 4.8 Momen rencana tiap segmen tumpuan A - D

No nodal	Jarak (m)	Momen Pelaksanaan (kNm)	Momen servise		Momen rencana	
			Maks (kNm)	Min (kNm)	Positip (kNm)	Negatip (kNm)
81	200.0	-456000.0000	-297780.1000	-369807.6000	-	-456000.0000
82	202.5	-497005.0000	-341043.3000	-421438.8000	-	-497005.0000
83	205.0	-540042.0000	-386488.6000	-475542.0000	-	-540042.0000
84	207.5	-585141.0000	-434147.1000	-532148.4000	-	-585141.0000
85	210.0	-632333.0000	-484050.1000	-591289.4000	-	-632333.0000
86	212.5	-585141.0000	-440118.1000	-538485.5000	-	-585141.0000
87	215.0	-540042.0000	-398430.6000	-488268.9000	-	-540042.0000
88	217.5	-497005.0000	-358956.3000	-440608.4000	-	-497005.0000
89	220.0	-456000.0000	-317406.6000	-395472.7000	-	-456000.0000
90	222.5	-416995.0000	-278017.3000	-361336.0000	-	-416995.0000
91	225.0	-379958.0000	-241090.3000	-325061.2000	-	-379958.0000
92	227.5	-344859.0000	-206594.3000	-290874.7000	-	-344859.0000
93	230.0	-311667.0000	-174498.3000	-258745.2000	-	-311667.0000
94	232.5	-280349.0000	-144770.8000	-228641.4000	-	-280349.0000
95	235.0	-250875.0000	-117380.6000	-200532.2000	-	-250875.0000
96	237.5	-223214.0000	-92296.4800	-174386.2000	-	-223214.0000
97	240.0	-197333.0000	-69487.2100	-150172.1000	-	-197333.0000
98	242.5	-173203.0000	-48921.5400	-127858.9000	-	-173203.0000
99	245.0	-150792.0000	-30568.1900	-107415.1000	-	-150792.0000
100	247.5	-130068.0000	-15223.3500	-88809.6100	-	-130068.0000
101	250.0	-111000.0000	-2028.3300	-72011.1000	-	-111000.0000
102	252.5	-93557.3000	9048.1000	-56988.3500	9048.1000	-93557.3000
103	255.0	-77708.3000	18037.2000	-43710.0900	18037.2000	-77708.3000
104	257.5	-63421.9000	24970.2200	-32145.0800	24970.2200	-63421.9000
105	260.0	-50666.7000	29878.4100	-22262.0800	29878.4100	-50666.7000
106	262.5	-39411.5000	32793.0300	-14029.8000	32793.0300	-39411.5000
107	265.0	-29625.0000	33745.3000	-7417.0500	33745.3000	-29625.0000
108	267.5	-21276.0000	32766.5000	-2392.5400	32766.5000	-21276.0000
109	270.0	-14333.3000	29887.8600	1074.9700	29887.8600	-14333.3000
110	272.5	-8765.6300	25140.6500	3016.7300	25140.6500	-8765.6300
111	275.0	-4541.6700	18556.0900	3463.9800	18556.0900	-4541.6700
112	277.5	-1630.2100	10165.4700	2448.0000	10165.4700	-1630.2100
113	280.0	0.0000	0.0000	0.0000	0.0000	0.0000

4.11 Perhitungan Gaya Prategang Tiap Segmen Tumpuan A - D



4.11.1 Gaya prategang efektif dan awal pada kabel bawah untuk momen rencana positif

Mengacu pada formula (3.23) dan (3.24), maka diperoleh ;

Gaya prategang efektif No nodal 2 adalah

$$\text{Gaya prategang efektif (Pe)} = \frac{Mr}{e_b + k_t} = \frac{10165,4700}{1,5275 + 0,7491}$$

$$= 4458,7350 \text{ kN}$$

Gaya prategang awal No nodal 2 adalah

$$\text{Gaya prategang awal (Po)} = \frac{Pe}{0,8} = \frac{4458,7350}{0,8}$$

$$= 5573,4188 \text{ kN}$$

Untuk gaya prategang efektif dan awal pada kabel bawah untuk momen rencana positif selanjutnya dapat dilihat pada tabel 4.9

4.11.2 Gaya prategang efektif dan awal pada kabel atas untuk momen rencana negatif

Mengacu pada formula (3.23) dan (3.24), maka diperoleh ;

Gaya prategang efektif No nodal 2 adalah

$$\text{Gaya prategang efektif (Pe)} = \frac{Mr}{e_t + k_b} = \frac{1630{,}2100}{1{,}0725 + 1{,}0170}$$

$$= 778{,}8123 \text{ kN}$$

Gaya prategang awal No nodal 2 adalah

$$\text{Gaya prategang awal (Po)} = \frac{Pe}{0{,}8} = \frac{778{,}8123}{0{,}8}$$

$$= 973{,}5154 \text{ kN}$$

Untuk gaya prategang efektif dan awal pada kabel atas untuk momen rencana negatif selanjutnya dapat dilihat pada tabel 4.9

Tabel 4.9 Gaya prategang tiap segmen tumpuan A - D

No nodal	et (m)	eb (m)	kt (m)	kb (m)	Momen rencana Momen maks		Kabel bawah		Kabel atas	
					Positif (kNm)	Negatif (kNm)	Pe (kN)	Po (kN)	Pe (kN)	Po (kN)
1	1.0725	1.5275	0.7491	1.0170	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1.0749	1.5293	0.7506	1.0183	10165.4700	-1630.2100	4458.7350	5573.4188	778.8123	973.5154
3	1.0821	1.5345	0.7552	1.0223	18556.0900	-4541.6700	8104.1577	10130.1972	2158.1781	2697.7226
4	1.0942	1.5433	0.7628	1.0290	25140.6400	-8765.6300	10901.7996	13627.2495	4128.4994	5160.6243
5	1.1112	1.5554	0.7735	1.0383	29887.8600	-14333.3000	12833.4664	16041.8331	6668.2019	8335.2524
6	1.1330	1.5709	0.7872	1.0501	32766.5000	-21276.0000	13895.2971	17369.1213	9745.7744	12182.2179
7	1.1598	1.5898	0.8040	1.0645	33745.3000	-29625.0000	14096.9588	17621.1985	13318.7969	16648.4962
8	1.1915	1.6122	0.8238	1.0814	32793.0300	-39411.5000	13461.8350	16827.2937	17339.7422	21674.6777
9	1.2285	1.6376	0.8468	1.1006	29878.4100	-50666.7000	12026.4088	15033.0110	21753.7675	27192.2094
10	1.2705	1.6663	0.8728	1.1220	24970.2200	-63421.9000	9834.2799	12292.8498	26508.6311	33135.7889
11	1.3177	1.6981	0.9020	1.1457	18037.2100	-77708.3000	6937.1216	8671.4021	31545.1409	39431.4261
12	1.3702	1.7329	0.9342	1.1713	9048.1000	-93557.3000	3392.4862	4240.6078	36811.8434	46014.8042
13	1.4281	1.7707	0.9696	1.1991	-	-111000.0000	-	-	42250.3045	52812.8806
14	1.4915	1.8113	1.0081	1.2286	-	-130068.0000	-	-	47817.3597	59771.6996
15	1.5604	1.8548	1.0497	1.2600	-	-150792.0000	-	-	53464.7568	66830.9460
16	1.6349	1.9010	1.0944	1.2930	-	-173203.0000	-	-	59156.0504	73945.0630
17	1.7150	1.9499	1.1422	1.3277	-	-197333.0000	-	-	64854.5700	81068.2124
18	1.8009	2.0014	1.1931	1.3638	-	-223214.0000	-	-	70532.4359	88165.5449
19	1.8926	2.0554	1.2470	1.4014	-	-250875.0000	-	-	76161.2022	95201.5027
20	1.9902	2.1119	1.3040	1.4404	-	-280349.0000	-	-	81720.1073	102150.1341
21	2.0937	2.1709	1.3640	1.4807	-	-311667.0000	-	-	87194.2144	108992.7680
22	2.2032	2.2323	1.4271	1.5222	-	-344859.0000	-	-	92569.6569	115712.0712
23	2.3186	2.2961	1.4930	1.5649	-	-379958.0000	-	-	97839.0627	122298.8284
24	2.4402	2.3622	1.5619	1.6088	-	-416995.0000	-	-	102987.1573	128733.9467
25	2.5678	2.4306	1.6337	1.6538	-	-456000.0000	-	-	108015.9181	135019.8977

Lanjutan tabel 4.9 Gaya prategang tiap segmen tumpuan A - D

No nodal	et (m)	eb (m)	kt (m)	kb (m)	Momen rencana Momen maks		Kabel bawah		Kabel atas	
					Positif (kN-m)	Negatif (kNm)	Pe (kN)	Po (kN)	Pe (kN)	Po (kN)
26	2.7017	2.5012	1.7084	1.6998	-	-497005.0000	-	-	112917.1873	141146.4842
27	2.8416	2.5741	1.7859	1.7469	-	-540042.0000	-	-	117694.6715	147118.3393
28	2.9877	2.6493	1.8662	1.7950	-	-585141.0000	-	-	122345.3280	152931.6599
29	3.1401	2.7266	1.9493	1.8441	-	-632333.0000	-	-	126867.5013	158584.3766
30	2.9877	2.6493	1.8662	1.7950	-	-585141.0000	-	-	122345.3280	152931.6599
31	2.8416	2.5741	1.7859	1.7469	-	-540042.0000	-	-	117694.6715	147118.3393
32	2.7017	2.5012	1.7084	1.6998	-	-497005.0000	-	-	112917.1873	141146.4842
33	2.5678	2.4306	1.6337	1.6538	-	-456000.0000	-	-	108015.9181	135019.8977
34	2.4402	2.3622	1.5619	1.6088	-	-416995.0000	-	-	102987.1573	128733.9467
35	2.3186	2.2961	1.4930	1.5649	-	-379958.0000	-	-	97839.0627	122298.8284
36	2.2032	2.2323	1.4271	1.5222	-	-344859.0000	-	-	92569.6569	115712.0712
37	2.0937	2.1709	1.3640	1.4807	-	-311667.0000	-	-	87194.2144	108992.7680
38	1.9902	2.1119	1.3040	1.4404	-	-280349.0000	-	-	81720.1073	102150.1341
39	1.8926	2.0554	1.2470	1.4014	-	-250875.0000	-	-	76161.2022	95201.5027
40	1.8009	2.0014	1.1931	1.3638	-	-223214.0000	-	-	70532.4359	88165.5449
41	1.7150	1.9499	1.1422	1.3277	-	-197333.0000	-	-	64854.5700	81068.2124
42	1.6349	1.9010	1.0944	1.2930	1848.8300	-173203.0000	617.2231	771.5288	59156.0504	73945.0630
43	1.5604	1.8548	1.0497	1.2600	29607.9400	-150792.0000	10193.8165	12742.2706	53464.7568	66830.9460
44	1.4915	1.8113	1.0081	1.2286	55238.7900	-130068.0000	19592.3920	24490.4900	47817.3597	59771.6996
45	1.4281	1.7707	0.9696	1.1991	78772.6200	-111000.0000	28745.9840	35932.4800	42250.3045	52812.8806
46	1.3702	1.7329	0.9342	1.1713	100240.7000	-93557.3000	37584.1551	46980.1938	36811.8434	46014.8042
47	1.3177	1.6981	0.9020	1.1457	119674.3000	-77708.3000	46026.8067	57533.5083	31545.1409	39431.4261
48	1.2705	1.6663	0.8728	1.1220	137159.1000	-63421.9000	54018.7862	67523.4827	26508.6311	33135.7889
49	1.2285	1.6376	0.8468	1.1006	153052.7000	-50666.7000	61605.4983	77006.8729	21753.7675	27192.2094
50	1.1915	1.6122	0.8238	1.0814	167005.6000	-39411.5000	68557.3071	85696.6338	17339.7422	21674.6777

Lanjutan tabel 4.9 Gaya prategang tiap segmen tumpuan A - D

No nodal	et (m)	eb (m)	kt (m)	kb (m)	Momen rencana Momen maks		Kabel bawah		Kabel atas	
					Positif (kNm)	Negatif (kNm)	Pe (kN)	Po (kN)	Pe (kN)	Po (kN)
51	1.1598	1.5898	0.8040	1.0645	179048.9000	-29625.0000	74796.9337	93496.1672	13318.7969	16648.4962
52	1.1330	1.5709	0.7872	1.0501	189214.0000	-21276.0000	80240.0237	100300.0297	9745.7744	12182.2179
53	1.1112	1.5554	0.7735	1.0383	197532.1000	-14333.3000	84817.7680	106022.2101	6668.2019	8335.2524
54	1.0942	1.5433	0.7628	1.0290	204034.4000	-8765.6200	88475.9551	110594.9438	4128.4947	5160.6184
55	1.0821	1.3188	0.6890	0.9328	208752.2000	-4541.6700	103970.6146	129963.2683	2254.0424	2817.5530
56	1.0749	1.2963	0.6808	0.9236	211716.8000	-1630.2100	107084.5177	133855.6472	815.7168	1019.6460
57	1.0725	1.3106	0.6829	0.9271	212959.3000	0.0000	106826.8372	133533.5465	0.0000	0.0000
58	1.0749	1.3285	0.6882	0.9336	211716.8000	-1630.2100	104981.8020	131227.2524	311.6555	1014.5693
59	1.0821	1.3498	0.6966	0.9430	208752.2000	-4541.6700	102009.4801	127511.8501	2242.6892	2803.3616
60	1.0942	1.3746	0.7082	0.9553	204034.4000	-8765.6200	97961.5902	122451.9877	4276.9554	5346.1942
61	1.1112	1.4028	0.7230	0.9706	197532.1000	-14333.3000	92921.3002	116151.6253	6885.0514	8606.3142
62	1.1330	1.4344	0.7411	0.9886	189214.0000	-21276.0000	86974.9483	108718.6854	10028.2805	12535.3507
63	1.1598	1.4694	0.7624	1.0095	179048.9000	-29625.0000	80226.2299	100282.7874	13356.4790	17070.5988
64	1.1915	1.5078	0.7870	1.0331	167005.6000	-39411.5000	72775.6667	90969.5834	17716.2186	22145.2733
65	1.2285	1.5493	0.8150	1.0592	153052.7000	-50666.7000	64734.8898	80918.6123	22147.4407	27684.3008
66	1.2705	1.5940	0.8463	1.0879	137159.1000	-63421.9000	56205.8353	70257.2942	26891.9182	33614.8978
67	1.3177	1.6420	0.8809	1.1189	119293.4000	-77708.3000	47284.2364	59105.2955	31892.1038	39865.1297
68	1.3702	1.6928	0.9188	1.1521	100240.7000	-93557.3000	38382.8687	47978.5859	37092.0588	46365.0735
69	1.4281	1.7466	0.9602	1.1874	78772.6200	-111000.0000	29101.7511	36377.1889	42439.3041	53049.1302
70	1.4915	1.8033	1.0049	1.2247	55238.7800	-130068.0000	19670.5292	24588.1615	47886.0172	59857.5215
71	1.5604	1.8628	1.0530	1.2639	29607.9300	-150792.0000	10154.3076	12692.8845	53390.9287	66738.6609
72	1.6349	1.9251	1.1044	1.3048	1848.8200	-173203.0000	610.2723	762.8404	58918.5971	73648.2464
73	1.7150	1.9900	1.1591	1.3473	-	-197333.0000	-	-	64439.4736	80549.3420
74	1.8009	2.0575	1.2171	1.3913	-	-223214.0000	-	-	69924.8167	87406.0209
75	1.8926	2.1277	1.2785	1.4367	-	-250875.0000	-	-	75353.6780	94192.0974

Lanjutan tabel 4.9 Gaya prategang tiap segmen tumpuan A - D

No nodal	et (m)	eb (m)	kt (m)	kb (m)	Momen rencana Momen maks		Kabel bawah		Kabel atas	
					Positif (kNm)	Negatif (kNm)	Pe (kN)	Po (kN)	Pe (kN)	Po (kN)
76	1.9902	2.2002	1.3430	1.4834	-	-280349.0000	-	-	80708.4869	100885.6086
77	2.0937	2.2753	1.4108	1.5314	-	-311667.0000	-	-	85974.7317	107468.4147
78	2.2032	2.3527	1.4818	1.5806	-	-344859.0000	-	-	91140.9165	113926.1457
79	2.3186	2.4326	1.5558	1.6308	-	-379958.0000	-	-	96206.5124	120258.1405
80	2.4402	2.5148	1.6332	1.6822	-	-416995.0000	-	-	101153.4543	126441.8179
81	2.5678	2.5993	1.7134	1.7345	-	-456000.0000	-	-	105989.8194	132487.2742
82	2.7017	2.5012	1.7084	1.6998	-	-497005.0000	-	-	112917.1873	141146.4842
83	2.8416	2.5741	1.7859	1.7469	-	-540042.0000	-	-	117594.6715	147118.3393
84	2.9877	2.6493	1.8662	1.7950	-	-585141.0000	-	-	122345.3280	152931.6599
85	3.1401	2.7266	1.9493	1.8441	-	-632333.0000	-	-	126967.5013	158584.3766
86	2.9877	2.6493	1.8662	1.7950	-	-585141.0000	-	-	122345.3280	152931.6599
87	2.8416	2.5741	1.7859	1.7469	-	-540042.0000	-	-	117594.6715	147118.3393
88	2.7017	2.5012	1.7084	1.6998	-	-497005.0000	-	-	112917.1873	141146.4842
89	2.5678	2.4306	1.6337	1.6538	-	-456000.0000	-	-	108015.9181	135019.8977
90	2.4402	2.3622	1.5619	1.6088	-	-416995.0000	-	-	102987.1573	128733.9467
91	2.3186	2.2961	1.4930	1.5649	-	-379958.0000	-	-	97839.0627	122298.8284
92	2.2032	2.2323	1.4271	1.5222	-	-344859.0000	-	-	92569.6569	115712.0712
93	2.0937	2.1709	1.3640	1.4807	-	-311667.0000	-	-	87194.2144	108992.7680
94	1.9902	2.1119	1.3040	1.4404	-	-280349.0000	-	-	81720.1073	102150.1341
95	1.8926	2.0554	1.2470	1.4014	-	-250875.0000	-	-	76161.2022	95201.5027
96	1.8009	2.0014	1.1931	1.3638	-	-223214.0000	-	-	70532.4359	88165.5449
97	1.7150	1.9499	1.1422	1.3277	-	-197333.0000	-	-	64854.5700	81068.2124
98	1.6349	1.9010	1.0944	1.2930	-	-173203.0000	-	-	59156.0504	73945.0630
99	1.5604	1.8548	1.0497	1.2600	-	-150792.0000	-	-	53464.7568	66830.9460
100	1.4915	1.8113	1.0081	1.2286	-	-130068.0000	-	-	47817.3597	59771.6996

Lanjutan tabel 4.9 Gaya prategang tiap segmen tumpuan A - D

No nodal	et (m)	eb (m)	kt (m)	kb (m)	Momen rencana Momen maks		Kabel bawah		Kabel atas	
					Positif (kNm)	Negatif (kNm)	Pe (kN)	Po (kN)	Pe (kN)	Po (kN)
101	1.4281	1.7707	0.9696	1.1991	-	-111000.0000	-	-	45396.9163	56746.1454
102	1.3702	1.7329	0.9342	1.1713	9048.1000	-93557.3000	3643.2857	4554.1071	39169.8974	48962.3718
103	1.3177	1.6981	0.9020	1.1457	18037.2000	-77708.3000	7352.2195	9190.2743	33208.6752	41510.8440
104	1.2705	1.6663	0.8728	1.1220	24970.2200	-63421.9000	10279.6180	12849.5225	27580.7349	34475.9187
105	1.2285	1.6376	0.8468	1.1006	29878.4100	-50666.7000	12392.0244	15490.0305	22351.6411	27939.5513
106	1.1915	1.6122	0.8238	1.0814	32793.0300	-39411.5000	13667.1793	17083.9741	17581.8612	21977.3265
107	1.1598	1.5898	0.8040	1.0645	33745.3000	-29625.0000	14096.9588	17621.1985	13318.7969	16648.4962
108	1.1330	1.5709	0.7872	1.0501	32766.5000	-21276.0000	13682.9248	17103.6560	9608.0202	12010.0253
109	1.1112	1.5554	0.7735	1.0383	29887.8600	-14333.3000	12441.8700	15552.3374	6480.3780	8100.4725
110	1.0942	1.5433	0.7628	1.0290	25140.6500	-8765.6300	10405.4675	13006.8344	3955.2522	4944.0653
111	1.0821	1.5345	0.7552	1.0223	18556.0900	-4541.6700	7615.8793	9519.8492	2038.6345	2548.2932
112	1.0749	1.5293	0.7506	1.0183	10165.4700	-1630.2100	4126.4339	5158.0424	725.7635	907.2044
113	1.0725	1.5275	0.7491	1.0170	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.12 Perhitungan Baja Prategang Tiap Segmen Tumpuan A - D

Mengacu pada formula (3.31) sampai (3.32), maka diperoleh ;

$f_{ps} = 0{,}74.f_{pu} = 0{,}74.1800 = 1332$ MPa

$f_{ps} = 0{,}82.f_{py}$, dimana $f_{py} = 0{,}85.f_{pu} = 0{,}74.1800 = 1530$ MPa

maka diperoleh ;

$f_{ps} = 0{,}82.1530 = 1254{,}6$ Mpa (dipilih)

4.12.1 Luas baja prategang

Kabel bawah

Mengacu pada formula (3.30), maka diperoleh ;

Luas baja prategang (kabel bawah) No nodal 2 adalah

$$Aps = \frac{Pe}{f_{ps}} = \frac{4458{,}7350.10^3}{1254{,}6} = 3553{,}9096 \text{ mm}^2$$

Kabel atas

Mengacu pada formula (3.30), maka diperoleh ;

Luas baja prategang (kabel atas) No nodal 2 adalah

$$Aps = \frac{Pe}{f_{ps}} = \frac{778{,}8123.10^3}{1254{,}6} = 620{,}7654 \text{ mm}^2$$

Untuk luas baja prategang selanjutnya dapat dilihat pada tabel 4.10

4.12.2 Jumlah baja prategang

Kabel bawah

Mengacu pada formula (3.22), dipakai kabel $_{27}K_{13}$ dengan data sebagai berikut ;

Diameter tiap kawat = 13 mm

Luas tiap kawat = $\frac{1}{4}\pi (13)^2$ = 133 mm^2

Luas kabel (tendon) = 27 x 133 = 3591 mm^2

Jarak as kabel ke tepi beton (b_{min}) = 200 mm

Jarak antar kabel min (a_{min}) = 275 mm

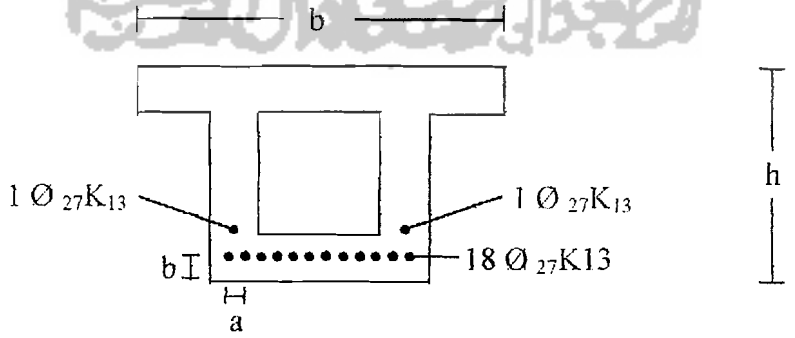
Gaya prategang (P) = 4970 kN

Jumlah kabel No nodal 2 adalah = $\frac{\text{Aps}}{\text{Aps(kabel)}}$

= $\frac{3553,9096}{3591}$

= 0,9897 ≈ 2 buah

Dengan perletakan kabel sebagai berikut ;



Kabel atas

Mengacu pada formula (3.22), dipakai kabel $_{19}K_{13}$ dengan data sebagai berikut ;

Diameter tiap kawat = 13 mm

Luas tiap kawat = $\frac{1}{4}\pi (13)^2$ = 133 mm^2

Luas kabel (tendon) = 19 x 133 = 2527 mm^2

Jarak as kabel ke tepi beton (b_{min}) = 150 mm

Jarak antar kabel min (a_{min}) = 250 mm

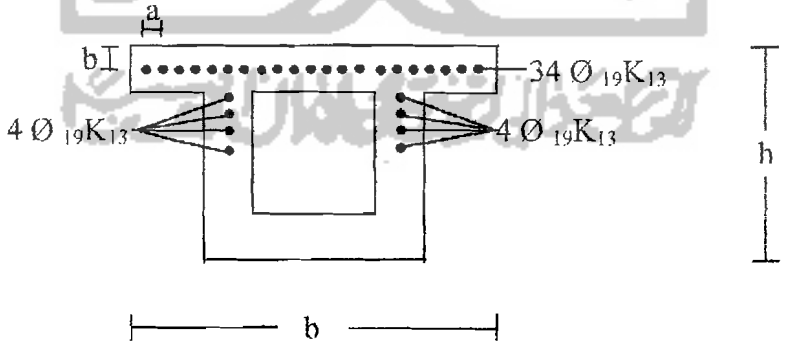
Gaya prategang (P) = 3500 kN

Jumlah kabel No nodal 2 adalah = $\frac{\text{Aps}}{\text{Aps(kabel)}}$

= $\frac{620,7654}{2527}$

= 0,2457 ≈ 1 buah

Dengan perletakan kabel sebagai berikut ;



Untuk jumlah kabel prategang selanjutnya dapat dilihat pada tabel 4.10

Tabel 4.10 Luas baja prategang dan jumlah kabel rencana tiap segmen tumpuan A - D

No nodal	Fpy (0,85Fpu) (Mpa)	Fps (0,82Fpy) (Mpa)	Kabel bawah		Kabel atas		Kabel bawah		Kabel atas		Jumlah kabel rencana	
			Pe (kN)	Aps (mm^2)	Pe (kN)	Aps (mm^2)	Pe (kN)	Jumlah	Pe (kN)	Jumlah	Bawah	Atas
1	1530.0000	1254.6000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0
2	1530.0000	1254.6000	4458.7350	3553.9096	778.8123	620.7654	4458.7350	0.9897	778.8123	0.2457	2	1
3	1530.0000	1254.6000	8104.1577	6459.5550	2158.1781	1720.2121	8104.1577	1.7988	2158.1781	0.6807	2	2
4	1530.0000	1254.6000	10901.7996	8689.4625	4128.4994	3290.6898	10901.7996	2.4198	4128.4994	1.3022	4	3
5	1530.0000	1254.6000	12833.4664	10229.1299	6668.2019	5315.0023	12833.4664	2.8485	6668.2019	2.1033	4	4
6	1530.0000	1254.6000	13895.2971	11075.4799	9745.7744	7768.0332	13895.2971	3.0842	9745.7744	3.0740	4	5
7	1530.0000	1254.6000	14096.9588	11236.2178	13318.7969	10615.9707	14096.9588	3.1290	13318.7969	4.2010	4	6
8	1530.0000	1254.6000	13461.8350	10729.9817	17339.7422	13820.9327	13461.8350	2.9880	17339.7422	5.4693	4	7
9	1530.0000	1254.6000	12026.4088	9585.8511	21753.7675	17339.2057	12026.4088	2.6694	21753.7675	6.8616	4	8
10	1530.0000	1254.6000	9834.2799	7838.5780	26508.6311	21129.1496	9834.2799	2.1828	26508.6311	8.3614	4	9
11	1530.0000	1254.6000	6937.1216	5529.3493	31545.1409	25143.5843	6937.1216	1.5398	31545.1409	9.9500	2	10
12	1530.0000	1254.6000	3392.4862	2704.0381	36811.8434	29341.4980	3392.4862	0.7530	36811.8434	11.6112	2	12
13	1530.0000	1254.6000	-	-	42250.3045	33676.3148	-	-	42250.3045	13.3266	-	14
14	1530.0000	1254.6000	-	-	47817.3597	38113.6296	-	-	47817.3597	15.0826	-	16
15	1530.0000	1254.6000	-	-	53464.7568	42614.9823	-	-	53464.7568	16.8639	-	17
16	1530.0000	1254.6000	-	-	59156.0504	47151.3234	-	-	59156.0504	18.6590	-	19
17	1530.0000	1254.6000	-	-	64854.5700	51693.4242	-	-	64854.5700	20.4564	-	21
18	1530.0000	1254.6000	-	-	70532.4359	56219.0626	-	-	70532.4359	22.2474	-	23
19	1530.0000	1254.6000	-	-	76161.2022	60705.5653	-	-	76161.2022	24.0228	-	25
20	1530.0000	1254.6000	-	-	81720.1073	65136.3839	-	-	81720.1073	25.7762	-	26
21	1530.0000	1254.6000	-	-	87194.2144	69499.6129	-	-	87194.2144	27.5028	-	28
22	1530.0000	1254.6000	-	-	92569.6569	73784.1997	-	-	92569.6569	29.1983	-	30
23	1530.0000	1254.6000	-	-	97839.0627	77984.2681	-	-	97839.0627	30.8604	-	31
24	1530.0000	1254.6000	-	-	102987.1573	82087.6433	-	-	102987.1573	32.4842	-	33
25	1530.0000	1254.6000	-	-	108015.9181	86095.9016	-	-	108015.9181	34.0704	-	35
26	1530.0000	1254.6000	-	-	112917.1873	90002.5405	-	-	112917.1873	35.6164	-	36

Lanjutan tabel 4.10 Luas baja prategang dan jumlah kabel rencana tiap segmen tumpuan A - D

No nodal	Fpy (0,85Fpu) (Mpa)	Fps (0,82Fpy) (Mpa)	Kabel bawah		Kabel atas		Kabel bawah		Kabel atas		Jumlah kabel rencana	
			Pe (kN)	Aps (mm^2)	Pe (kN)	Aps (mm^2)	Pe (kN)	Jumlah	Pe (kN)	Jumlah	Bawah	Atas
27	1530.0000	1254.6000	-	-	117694.6715	93810.5145	-	-	117694.6715	37.1233	-	38
28	1530.0000	1254.6000	-	-	122345.3280	97517.3984	-	-	122345.3280	38.5902	-	40
29	1530.0000	1254.6000	-	-	126867.5013	101121.8725	-	-	126867.5013	40.0166	-	42
30	1530.0000	1254.6000	-	-	122345.3280	97517.3984	-	-	122345.3280	38.5902	-	40
31	1530.0000	1254.6000	-	-	117694.6715	93810.5145	-	-	117694.6715	37.1233	-	38
32	1530.0000	1254.6000	-	-	112917.1873	90002.5405	-	-	112917.1873	35.6164	-	36
33	1530.0000	1254.6000	-	-	108015.9181	86095.9016	-	-	108015.9181	34.0704	-	35
34	1530.0000	1254.6000	-	-	102987.1573	82087.6433	-	-	102987.1573	32.4842	-	33
35	1530.0000	1254.6000	-	-	97839.0627	77984.2681	-	-	97839.0627	30.8604	-	31
36	1530.0000	1254.6000	-	-	92569.6569	73784.1997	-	-	92569.6569	29.1983	-	30
37	1530.0000	1254.6000	-	-	87194.2144	69499.6129	-	-	87194.2144	27.5028	-	28
38	1530.0000	1254.6000	-	-	81720.1073	65136.3839	-	-	81720.1073	25.7762	-	26
39	1530.0000	1254.6000	-	-	76161.2022	60705.5653	-	-	76161.2022	24.0228	-	25
40	1530.0000	1254.6000	-	-	70532.4359	56219.0626	-	-	70532.4359	22.2474	-	23
41	1530.0000	1254.6000	-	-	64854.5700	51693.4242	-	-	64854.5700	20.4564	-	21
42	1530.0000	1254.6000	617.2231	491.9680	59156.0504	47151.3234	617.2231	0.1370	59156.0504	18.6590	2	19
43	1530.0000	1254.6000	10193.8165	8125.1526	53464.7568	42614.9823	10193.8165	1.2626	53464.7568	16.8639	2	17
44	1530.0000	1254.6000	19592.3920	15616.4451	47817.3597	38113.6296	19592.3920	3.3488	47817.3597	15.0826	4	16
45	1530.0000	1254.6000	28745.9840	22912.4693	42250.3045	33676.3148	28745.9840	5.3805	42250.3045	13.3266	6	14
46	1530.0000	1254.6000	37584.1551	29957.0820	36811.8434	29341.4980	37584.1551	7.3423	36811.8434	11.6112	8	12
47	1530.0000	1254.6000	46026.8067	36686.4393	31545.1409	25143.5843	46026.8067	9.2162	31545.1409	9.9500	10	10
48	1530.0000	1254.6000	54018.7862	43056.5807	26508.6311	21129.1496	54018.7862	10.9901	26508.6311	8.3614	12	9
49	1530.0000	1254.6000	61605.4983	49103.6970	21753.7675	17339.2057	61605.4983	12.6741	21753.7675	6.8616	14	8
50	1530.0000	1254.6000	68557.3071	54644.7530	17339.7422	13820.9327	68557.3071	14.2171	17339.7422	5.4693	16	7
51	1530.0000	1254.6000	74796.9337	59618.1522	13318.7969	10615.9707	74796.9337	15.6021	13318.7969	4.2010	16	6
52	1530.0000	1254.6000	80240.0237	63956.6585	9745.7744	7768.0332	80240.0237	16.8103	9745.7744	3.0740	18	5

Lanjutan tabel 4.10 Luas baja prategang dan jumlah kabel rencana tiap segmen tumpuan A - D

No nodal	Fpy (0,85Fpu) (Mpa)	Fps (0,82Fpy) (Mpa)	Kabel bawah		Kabel atas		Kabel bawah		Kabel atas		Jumlah kabel rencana	
			Pe (kN)	Aps (mm^2)	Pe (kN)	Aps (mm^2)	Pe (kN)	Jumlah	Pe (kN)	Jumlah	Bawah	Atas
53	1530.0000	1254.6000	84817.7680	67605.4264	6668.2019	5315.0023	84817.7680	17.8264	6668.2019	2.1033	20	4
54	1530.0000	1254.6000	88475.9551	70521.2459	4128.4947	3290.6860	88475.9551	18.6383	4128.4947	1.3022	20	3
55	1530.0000	1254.6000	103970.6146	82871.5245	2254.0424	1796.6223	103970.6146	22.0776	2254.0424	0.7110	20	2
56	1530.0000	1254.6000	107084.5177	85353.5132	815.7168	650.1808	107084.5177	22.7687	815.7168	0.2573	20	1
57	1530.0000	1254.6000	106826.8372	85148.1247	0.0000	0.0000	106826.8372	22.7115	0.0000	0.0000	20	0
58	1530.0000	1254.6000	104981.8020	83677.5084	811.6555	646.9436	104981.8020	22.3020	811.6555	0.2560	20	1
59	1530.0000	1254.6000	102009.4801	81308.3693	2242.6892	1787.5731	102009.4801	21.6423	2242.6892	0.7074	20	2
60	1530.0000	1254.6000	97961.5902	78081.9307	4276.9554	3409.0191	97961.5902	20.7438	4276.9554	1.3490	20	3
61	1530.0000	1254.6000	92921.3002	74064.4829	6885.0514	5487.8458	92921.3002	19.6250	6885.0514	2.1717	20	4
62	1530.0000	1254.6000	86974.9483	69324.8432	10028.2805	7993.2094	86974.9483	18.3052	10028.2805	3.1631	18	5
63	1530.0000	1254.6000	80226.2299	63945.6639	13656.4790	10885.1259	80226.2299	16.8072	13656.4790	4.3075	16	6
64	1530.0000	1254.6000	72775.6667	58007.0674	17716.2186	14121.0096	72775.6667	15.1535	17716.2186	5.5881	16	7
65	1530.0000	1254.6000	64734.8898	51598.0311	22147.4407	17652.9896	64734.8898	13.3687	22147.4407	6.9857	14	8
66	1530.0000	1254.6000	56205.8353	44799.8050	26891.9182	21434.6550	56205.8353	11.4756	26891.9182	8.4823	12	9
67	1530.0000	1254.6000	47284.2364	37688.6947	31892.1038	25420.1369	47284.2364	9.4953	31892.1038	10.0594	10	10
68	1530.0000	1254.6000	38382.8687	30593.7101	37092.0588	29564.8484	38382.8687	7.5196	37092.0588	11.6996	8	12
69	1530.0000	1254.6000	29101.7511	23196.0395	42439.3041	33826.9601	29101.7511	5.4595	42439.3041	13.3862	6	14
70	1530.0000	1254.6000	19670.5292	15678.7256	47886.0172	38168.3542	19670.5292	3.3661	47886.0172	15.1042	4	16
71	1530.0000	1254.6000	10154.3076	8093.6614	53390.9287	42556.1364	10154.3076	1.2539	53390.9287	16.8406	2	17
72	1530.0000	1254.6000	610.2723	486.4278	58918.5971	46962.0573	610.2723	0.1355	58918.5971	18.5841	2	19
73	1530.0000	1254.6000	-	-	64439.4736	51362.5646	-	-	64439.4736	20.3255	-	21
74	1530.0000	1254.6000	-	-	69924.8167	55734.7495	-	-	69924.8167	22.0557	-	23
75	1530.0000	1254.6000	-	-	75353.6780	60061.9146	-	-	75353.6780	23.7681	-	25
76	1530.0000	1254.6000	-	-	80708.4869	64330.0549	-	-	80708.4869	25.4571	-	26
77	1530.0000	1254.6000	-	-	85974.7317	68527.6038	-	-	85974.7317	27.1182	-	28
78	1530.0000	1254.6000	-	-	91140.9165	72645.3981	-	-	91140.9165	28.7477	-	30

Lanjutan tabel 4.10 Luas baja prategang dan jumlah kabel rencana tiap segmen tumpuan A - D

No nodal	Fpy (0,85Fpu) (Mpa)	Fps (0.82Fpy) (Mpa)	Kabel bawah		Kabel atas		Kabel bawah		Kabel atas		Jumlah kabel rencana	
			Pe (kN)	Aps (mm^2)	Pe (kN)	Aps (mm^2)	Pe (kN)	Jumlah	Pe (kN)	Jumlah	Bawah	Atas
79	1530.0000	1254.6000	-	-	96206.5124	76683.0164	-	-	96206.5124	30.3455	-	31
80	1530.0000	1254.6000	-	-	101153.4543	80626.0595	-	-	101153.4543	31.9058	-	33
81	1530.0000	1254.6000	-	-	105989.8194	84480.9656	-	-	105989.8194	33.4313	-	35
82	1530.0000	1254.6000	-	-	112917.1873	90002.5405	-	-	112917.1873	35.6164	-	36
83	1530.0000	1254.6000	-	-	117694.6715	93810.5145	-	-	117694.6715	37.1233	-	38
84	1530.0000	1254.6000	-	-	122345.3280	97517.3984	-	-	122345.3280	38.5902	-	40
85	1530.0000	1254.6000	-	-	126867.5013	101121.8725	-	-	126867.5013	40.0166	-	42
86	1530.0000	1254.6000	-	-	122345.3280	97517.3984	-	-	122345.3280	38.5902	-	40
87	1530.0000	1254.6000	-	-	117694.6715	93810.5145	-	-	117694.6715	37.1233	-	38
88	1530.0000	1254.6000	-	-	112917.1873	90002.5405	-	-	112917.1873	35.6164	-	36
89	1530.0000	1254.6000	-	-	108015.9181	86095.9016	-	-	108015.9181	34.0704	-	35
90	1530.0000	1254.6000	-	-	102987.1573	82087.6433	-	-	102987.1573	32.4842	-	33
91	1530.0000	1254.6000	-	-	97839.0627	77984.2681	-	-	97839.0627	30.8604	-	31
92	1530.0000	1254.6000	-	-	92569.6569	73784.1997	-	-	92569.6569	29.1983	-	30
93	1530.0000	1254.6000	-	-	87194.2144	69499.6129	-	-	87194.2144	27.5028	-	28
94	1530.0000	1254.6000	-	-	81720.1073	65136.3839	-	-	81720.1073	25.7762	-	26
95	1530.0000	1254.6000	-	-	76161.2022	60705.5653	-	-	76161.2022	24.0228	-	25
96	1530.0000	1254.6000	-	-	70532.4359	56219.0626	-	-	70532.4359	22.2474	-	23
97	1530.0000	1254.6000	-	-	64854.5700	51693.4242	-	-	64854.5700	20.4564	-	21
98	1530.0000	1254.6000	-	-	59156.0504	47151.3234	-	-	59156.0504	18.6590	-	19
99	1530.0000	1254.6000	-	-	53464.7568	42614.9823	-	-	53464.7568	16.8639	-	17
100	1530.0000	1254.6000	-	-	47817.3597	38113.6296	-	-	47817.3597	15.0826	-	16
101	1530.0000	1254.6000	-	-	45396.9163	36184.3745	-	-	45396.9163	14.3191	-	14
102	1530.0000	1254.6000	3643.2857	2903.9421	39169.8974	31221.0245	3643.2857	0.8087	39169.8974	12.3550	2	12
103	1530.0000	1254.6000	7352.2195	5860.2100	33208.6752	26469.5323	7352.2195	1.6319	33208.6752	10.4747	2	10
104	1530.0000	1254.6000	10279.6180	8193.5422	27580.7349	21983.6879	10279.6180	2.2817	27580.7349	8.6995	4	9

Lanjutan tabel 4.10 Luas baja prategang dan jumlah kabel rencana tiap segmen tumpuan A - D

No nodal	Fpy (0,85Fpu) (Mpa)	Fps (0,82Fpy) (Mpa)	Kabel bawah		Kabel atas		Kabel bawah		Kabel atas		Jumlah kabel rencana	
			Pe (kN)	Aps (mm^2)	Pe (kN)	Aps (mm^2)	Pe (kN)	Jumlah	Pe (kN)	Jumlah	Bawah	Atas
105	1530.0000	1254.6000	12392.0244	9877.2712	22351.6411	17815.7509	12392.0244	2.7506	22351.6411	7.0502	4	8
106	1530.0000	1254.6000	13667.1793	10893.6548	17581.8612	14013.9177	13667.1793	3.0336	17581.8612	5.5457	4	7
107	1530.0000	1254.6000	14096.9588	11236.2178	13318.7969	10615.9707	14096.9588	3.1290	13318.7969	4.2010	4	6
108	1530.0000	1254.6000	13682.9248	10906.2050	9608.0202	7658.2339	13682.9248	3.0371	9608.0202	3.0306	4	5
109	1530.0000	1254.6000	12441.8700	9917.0014	6480.3780	5165.2941	12441.8700	2.7616	6480.3780	2.0440	4	4
110	1530.0000	1254.6000	10405.4675	8293.8526	3955.2522	3152.6002	10405.4675	2.3096	3955.2522	1.2476	4	3
111	1530.0000	1254.6000	7615.8793	6070.3645	2038.6345	1624.9279	7615.8793	1.6904	2038.6345	0.6430	2	2
112	1530.0000	1254.6000	4126.4339	3289.0434	725.7635	578.4820	4126.4339	0.9159	725.7635	0.2289	2	1
113	1530.0000	1254.6000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0	0

4.13 Perhitungan Tegangan Akibat Momen Tiap Segmen Tumpuan A - D

4.13.1 Saat trasfer akibat momen saat pelaksanaan

Mengacu pada formula (3.33) dan (3.34), maka diperoleh ;

Tegangan pada serat atas dan bawah untuk No nodal 2 adalah

$$f\ atas = \frac{M_{tp}}{Z_t} = \frac{1630,2100.10^6}{8,1541.10^9} = +0,1999\ Mpa$$

$$f\ bawah = \frac{M_{tp}}{Z_b} = \frac{1630,2100.10^6}{6,0104.10^9} = -0,2712\ Mpa$$

Untuk tegangan selanjutnya dapat dilihat pada tabel 4.11

4.13.2 Saat trasfer akibat momen saat servise

Mengacu pada formula (3.35) dan (3.36), maka diperoleh ;

Tegangan pada serat atas dan bawah untuk No nodal 2 adalah

$$f\ atas = \frac{M_o}{Z_t} = \frac{4909,2100.10^6}{8,1541.10^9} = -0,6021\ Mpa$$

$$f\ bawah = \frac{M_o}{Z_b} = \frac{4909,2100.10^6}{6,0104.10^9} = +0,8168\ Mpa$$

Untuk tegangan selanjutnya dapat dilihat pada tabel 4.11

Tabel 4.11 Tegangan saat transfer akibat momen saat pelaksanaan dan servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Saat pelaksanaan	Saat servise	Zt	Zb	Tegangan Saat pelaksanaan		Tegangan Saat servise	
		Momen (kNm)	Momen (kNm)	(m^3)	(m^3)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
1	0.0	0.0000	0.0000	8.1356	5.9928	0.0000	0.0000	0.0000	0.0000
2	2.5	-1630.2100	4909.2100	8.1541	6.0104	0.1999	-0.2712	-0.6021	0.8168
3	5.0	-4541.6700	8537.1600	8.2079	6.0629	0.5533	-0.7491	-1.0401	1.4081
4	7.5	-8765.6300	10852.6200	8.2983	6.1514	1.0563	-1.4250	-1.3078	1.7643
5	10.0	-14333.3300	11824.3200	8.4248	6.2761	1.7013	-2.2838	-1.4035	1.8840
6	12.5	-21276.0400	11421.0300	8.5882	6.4377	2.4774	-3.3049	-1.3299	1.7741
7	15.0	-29625.0000	9611.4800	8.7892	6.6379	3.3706	-4.4630	-1.0936	1.4480
8	17.5	-39411.4600	6364.4400	9.0288	6.8778	4.3651	-5.7302	-0.7049	0.9254
9	20.0	-50666.6700	1648.6500	9.3066	7.1607	5.4442	-7.0757	-0.1771	0.2302
10	22.5	-63421.8700	-4567.1500	9.6238	7.4865	6.5901	-8.4715	0.4746	-0.6101
11	25.0	-77708.3300	-12314.1900	9.9821	7.8586	7.7848	-9.8883	1.2336	-1.5670
12	27.5	-93557.2900	-21623.7400	10.381	8.2793	9.0124	-11.3001	2.0830	-2.6118
13	30.0	-111000.0000	-32527.0300	10.8232	8.752	10.2557	-12.6828	3.0053	-3.7165
14	32.5	-130067.7100	-45055.3300	11.3092	9.2794	11.5011	-14.0168	3.9840	-4.8554
15	35.0	-150791.6700	-59239.8700	11.8404	9.8646	12.7354	-15.2861	5.0032	-6.0053
16	37.5	-173203.1300	-75111.9100	12.4183	10.5113	13.9474	-16.4778	6.0485	-7.1458
17	40.0	-197333.3300	-92702.7100	13.0447	11.2227	15.1275	-17.5834	7.1065	-8.2603
18	42.5	-223213.5400	-112043.5000	13.7214	12.0038	16.2675	-18.5952	8.1656	-9.3340
19	45.0	-250875.0000	-133165.5500	14.4501	12.858	17.3615	-19.5112	9.2155	-10.3566
20	47.5	-280348.9600	-156100.0900	15.232	13.7901	18.4053	-20.3297	10.2482	-11.3197
21	50.0	-311666.6700	-180878.3900	16.0705	14.8048	19.3937	-21.0517	11.2553	-12.2176
22	52.5	-344859.3700	-207531.6800	16.9672	15.9068	20.3251	-21.6800	12.2313	-13.0467
23	55.0	-379958.3300	-236091.2200	17.9244	17.1002	21.1978	-22.2195	13.1715	-13.8063
24	57.5	-416994.7900	-266588.2700	18.9444	18.392	22.0115	-22.6726	14.0721	-14.4948
25	60.0	-456000.0000	-299054.0600	20.0298	19.786	22.7661	-23.0466	14.9305	-15.1144

Lanjutan tabel 4.11 Tegangan saat transfer akibat momen saat pelaksanaan dan servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Saat pelaksanaan	Saat servise	Zt	Zb	Tegangan Saat pelaksanaan		Tegangan Saat servise	
		Momen (kNm)	Momen (kNm)	(m^3)	(m^3)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
26	62.5	-497005.2100	-333519.8600	21.1831	21.2903	23.4623	-23.3442	15.7446	-15.6653
27	65.0	-540041.6700	-370016.9000	22.4073	22.9074	24.1011	-23.5750	16.5132	-16.1527
28	67.5	-585140.6300	-408576.4500	23.7056	24.6449	24.6836	-23.7429	17.2354	-16.5785
29	70.0	-632333.3300	-449229.7400	25.0803	26.5105	25.2124	-23.8522	17.9117	-16.9454
30	72.5	-585140.6200	-403037.0300	23.7056	24.6449	24.6836	-23.7429	17.0018	-16.3538
31	75.0	-540041.6700	-358938.0700	22.4073	22.9074	24.1011	-23.5750	16.0188	-15.6691
32	77.5	-497005.2100	-316901.6100	21.1831	21.2903	23.4623	-23.3442	14.9601	-14.8848
33	80.0	-456000.0000	-276896.4100	20.0298	19.786	22.7661	-23.0466	13.8242	-13.9946
34	82.5	-416994.7900	-238891.2000	18.9444	18.392	22.0115	-22.6726	12.6101	-12.9889
35	85.0	-379958.3300	-202854.7400	17.9244	17.1002	21.1978	-22.2195	11.3172	-11.8627
36	87.5	-344859.3700	-168755.7800	16.9672	15.9068	20.3251	-21.6800	9.9460	-10.6090
37	90.0	-311666.6700	-136563.0700	16.0705	14.8048	19.3937	-21.0517	8.4977	-9.2242
38	92.5	-280348.9600	-106245.3700	15.232	13.7901	18.4053	-20.3297	6.9751	-7.7045
39	95.0	-250875.0000	-77771.4100	14.4501	12.858	17.3615	-19.5112	5.3821	-6.0485
40	97.5	-223213.5400	-51109.9500	13.7214	12.0038	16.2675	-18.5952	3.7248	-4.2578
41	100.0	-197333.3300	-26229.7400	13.0447	11.2227	15.1275	-17.5834	2.0108	-2.3372
42	102.5	-173203.1200	-3099.5300	12.4183	10.5113	13.9474	-16.4778	0.2496	-0.2949
43	105.0	-150791.6700	18311.9300	11.8404	9.8646	12.7354	-15.2861	-1.5466	1.8563
44	107.5	-130067.7100	38035.3800	11.3092	9.2794	11.5011	-14.0168	-3.3633	4.0990
45	110.0	-111000.0000	56103.5900	10.8232	8.752	10.2557	-12.6828	-5.1836	6.4104
46	112.5	-93557.2900	72546.3000	10.381	8.2793	9.0124	-11.3001	-6.9884	8.7624
47	115.0	-77708.3300	87395.2600	9.9821	7.8586	7.7848	-9.8883	-8.7552	11.1210
48	117.5	-63421.8700	100681.7200	9.6238	7.4865	6.5901	-8.4715	-10.4617	13.4484
49	120.0	-50666.6700	112436.9200	9.3066	7.1607	5.4442	-7.0757	-12.0814	15.7019
50	122.5	-39411.4600	122692.1300	9.0288	6.8778	4.3651	-5.7302	-13.5890	17.8389

Lanjutan tabel 4.11 Tegangan saat transfer akibat momen saat pelaksanaan dan servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Saat pelaksanaan	Saat servise	Zt	Zb	Tegangan Saat pelaksanaan		Tegangan Saat servise	
		Momen (kNm)	Momen (kNm)	(m^3)	(m^3)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
51	125.0	-29625.0000	131478.5900	8.7892	6.6379	3.3706	-4.4630	-14.9591	19.8073
52	127.5	-21276.0400	138827.5500	8.5882	6.4377	2.4774	-3.3049	-16.1649	21.5648
53	130.0	-14333.3300	144770.2600	8.4248	6.2761	1.7013	-2.2838	-17.1838	23.0669
54	132.5	-8765.6200	149337.9700	8.2983	6.1514	1.0563	-1.4250	-17.9962	24.2771
55	135.0	-4541.6700	152561.9200	7.489	5.5318	0.6064	-0.8210	-20.3715	27.5791
56	137.5	-1630.2100	154473.3800	7.3956	5.4514	0.2204	-0.2990	-20.8872	28.3365
57	140.0	0.0000	155103.5900	7.4171	5.4635	0.0000	0.0000	-20.9116	28.3891
58	142.5	-1630.2100	154473.3800	7.4756	5.5103	0.2181	-0.2958	-20.6637	28.0336
59	145.0	-4541.6700	152561.9200	7.5709	5.5923	0.5999	-0.8121	-20.1511	27.2807
60	147.5	-8765.6200	149337.9600	7.7041	5.7109	1.1378	-1.5349	-19.3842	26.1496
61	150.0	-14333.3300	144770.2600	7.8752	5.8667	1.8201	-2.4432	-18.3831	24.6766
62	152.5	-21276.0400	138827.5500	8.0851	6.0606	2.6315	-3.5106	-17.1708	22.9066
63	155.0	-29625.0000	131478.5900	8.335	6.2949	3.5543	-4.7062	-15.7743	20.8865
64	157.5	-39411.4600	122692.1300	8.6255	6.5705	4.5692	-5.9982	-14.2243	18.6732
65	160.0	-50666.6700	112436.9200	8.9571	6.8917	5.6566	-7.3518	-12.5528	16.3148
66	162.5	-63421.8700	100681.7100	9.331	7.2587	6.7969	-8.7374	-10.7900	13.8705
67	165.0	-77708.3300	87395.2600	9.7488	7.675	7.9711	-10.1249	-8.9547	11.3870
68	167.5	-93557.2900	72546.3000	10.2103	8.1431	9.1630	-11.4891	-7.1052	8.9089
69	170.0	-111000.0000	56103.5900	10.718	8.6669	10.3564	-12.8073	-5.2345	6.4733
70	172.5	-130067.7100	38035.8800	11.2732	9.2499	11.5378	-14.0615	-3.3740	4.1120
71	175.0	-150791.6700	18311.9200	11.8772	9.8953	12.6959	-15.2387	-1.5418	1.8506
72	177.5	-173203.1200	-3099.5400	12.5314	10.607	13.8215	-16.3291	0.2473	-0.2922
73	180.0	-197333.3300	-26229.7500	13.2373	11.3884	14.9074	-17.3276	1.9815	-2.3032
74	182.5	-223213.5400	-51109.9500	13.9976	12.2455	15.9466	-18.2282	3.6513	-4.1738
75	185.0	-250875.0000	-77771.4700	14.8142	13.182	16.9348	-19.0316	5.2498	-5.8998

Lanjutan tabel 4.11 Tegangan saat transfer akibat momen saat pelaksanaan dan servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Saat pelaksanaan	Saat servise	Zt	Zb	Tegangan Saat pelaksanaan		Tegangan Saat servise	
		Momen (kNm)	Momen (kNm)	(m^3)	(m^3)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
76	187.5	-280348.9600	-106245.3700	15.6872	14.2023	17.8712	-19.7397	6.7727	-7.4809
77	190.0	-311666.6700	-136563.0800	16.6212	15.3121	18.7512	-20.3543	8.2162	-8.9186
78	192.5	-344859.3700	-168755.7900	17.6182	16.5171	19.5740	-20.8789	9.5785	-10.2170
79	195.0	-379958.3300	-202854.7500	18.6793	17.8204	20.3411	-21.3215	10.8599	-11.3833
80	197.5	-416994.7900	-238891.2000	19.809	19.2314	21.0508	-21.6830	12.0597	-12.4219
81	200.0	-456000.0000	-276896.4100	21.0075	20.7518	21.7065	-21.9740	13.1808	-13.3432
82	202.5	-497005.2100	-316901.6200	21.1831	21.2903	23.4623	-23.3442	14.9301	-14.8848
83	205.0	-540041.6700	-358938.0800	22.4073	22.9074	24.1011	-23.5750	16.0188	-15.6691
84	207.5	-585140.6200	-403037.0400	23.7056	24.6449	24.6836	-23.7429	17.0018	-16.3538
85	210.0	-632333.3300	-449229.7500	25.0803	26.5105	25.2124	-23.8522	17.9117	-16.9454
86	212.5	-585140.6300	-408576.4500	23.7056	24.6449	24.6836	-23.7429	17.2354	-16.5785
87	215.0	-540041.6700	-370016.9100	22.4073	22.9074	24.1011	-23.5750	16.5132	-16.1527
88	217.5	-497005.2100	-333519.8600	21.1831	21.2903	23.4623	-23.3442	15.7446	-15.6653
89	220.0	-456000.0000	-299054.0700	20.0298	19.786	22.7661	-23.0466	14.9305	-15.1144
90	222.5	-416994.7900	-266588.2700	18.9444	18.392	22.0115	-22.6726	14.0721	-14.4948
91	225.0	-379958.3300	-236091.2300	17.9244	17.1002	21.1978	-22.2195	13.1715	-13.8063
92	227.5	-344859.3700	-207531.6300	16.9672	15.9068	20.3251	-21.6800	12.2313	-13.0467
93	230.0	-311666.6700	-180878.3900	16.0705	14.8048	19.3937	-21.0517	11.2553	-12.2176
94	232.5	-280348.9600	-156100.1000	15.232	13.7901	18.4053	-20.3297	10.2482	-11.3197
95	235.0	-250875.0000	-133165.5500	14.4501	12.858	17.3615	-19.5112	9.2155	-10.3566
96	237.5	-223213.5400	-112043.5100	13.7214	12.0038	16.2675	-18.5952	8.1656	-9.3340
97	240.0	-197333.3300	-92702.7100	13.0447	11.2227	15.1275	-17.5834	7.1065	-8.2603
98	242.5	-173203.1300	-75111.9200	12.4183	10.5113	13.9474	-16.4778	6.0485	-7.1458
99	245.0	-150791.6700	-59239.8700	11.8404	9.8646	12.7354	-15.2861	5.0032	-6.0053
100	247.5	-130067.7100	-45055.3300	11.3092	9.2794	11.5011	-14.0168	3.9840	-4.8554

Lanjutan tabel 4.11 Tegangan saat transfer akibat momen saat pelaksanaan dan servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Saat pelaksanaan	Saat servise	Zt	Zb	Tegangan Saat pelaksanaan		Tegangan Saat servise	
		Momen (kNm)	Momen (kNm)	(m^3)	(m^3)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
101	250.0	-111000.0000	-32527.0300	10.8232	8.752	10.2557	-12.6828	3.0053	-3.7165
102	252.5	-93557.2900	-21623.7400	10.381	8.2793	9.0124	-11.3001	2.0830	-2.6118
103	255.0	-77708.3300	-12314.2000	9.9821	7.8586	7.7848	-9.8883	1.2336	-1.5670
104	257.5	-63421.8700	-4567.1500	9.6238	7.4865	6.5901	-8.4715	0.4746	-0.6101
105	260.0	-50666.6700	1648.6400	9.3066	7.1607	5.4442	-7.0757	-0.1771	0.2302
106	262.5	-39411.4600	6364.4400	9.0288	6.8778	4.3651	-5.7302	-0.7049	0.9254
107	265.0	-29625.0000	9611.4800	8.7892	6.6379	3.3706	-4.4630	-1.0936	1.4480
108	267.5	-21276.0400	11421.0300	8.5882	6.4377	2.4774	-3.3049	-1.3299	1.7741
109	270.0	-14333.3300	11824.3200	8.4248	6.2761	1.7013	-2.2838	-1.4035	1.8840
110	272.5	-8765.6300	10852.6200	8.2983	6.1514	1.0563	-1.4250	-1.3078	1.7643
111	275.0	-4541.6700	8537.1600	8.2079	6.0629	0.5533	-0.7491	-1.0401	1.4081
112	277.5	-1630.2100	4909.2100	8.1541	6.0104	0.1999	-0.2712	-0.6021	0.8168
113	280.0	0.0000	0.0000	8.1356	5.9928	0.0000	0.0000	0.0000	0.0000

4.13.3 Saat layan akibat momen saat pelaksanaan

Mengacu pada formula (3.33) dan (3.34), maka diperoleh ;

Tegangan pada serat atas dan bawah untuk No nodal 2 adalah

$$f\ atas = \frac{M_{tp}}{Z_t} = \frac{1630,2100.10^6}{8,1541.10^9} = +\ 0,1999\ Mpa$$

$$f\ bawah = \frac{M_{tp}}{Z_b} = \frac{1630,2100.10^6}{6,0104.10^9} = -\ 0,2712\ Mpa$$

Untuk tegangan selanjutnya dapat dilihat pada tabel 4.12

4.13.4 Saat layan akibat momen maks saat servise

Mengacu pada formula (3.37) dan (3.38), maka diperoleh ;

Tegangan pada serat atas dan bawah untuk No nodal 2 adalah

$$f\ atas = \frac{M_{ts}}{Z_t} = \frac{10165,4700.10^6}{8,1541.10^9} = -\ 1,2467\ Mpa$$

$$f\ bawah = \frac{M_{ts}}{Z_b} = \frac{10165,4700.10^6}{6,0104.10^9} = +\ 1,6913\ Mpa$$

Untuk tegangan selanjutnya dapat dilihat pada tabel 4.12

4.13.5 Saat layan akibat momen min saat servise

Mengacu pada formula (3.37) dan (3.38), maka diperoleh ;

Tegangan pada serat atas dan bawah untuk No nodal 2 adalah

$$f\,atas = \frac{M_{ts}}{Z_t} = \frac{2448,0000.10^6}{8,1541.10^9} = -0,3002\ Mpa$$

$$f\,bawah = \frac{M_{ts}}{Z_b} = \frac{2448,0000.10^6}{6,0104.10^9} = +0,4073\ Mpa$$

Untuk tegangan selanjutnya dapat dilihat pada tabel 4.12

Tabel 4.12 Tegangan saat layan akibat momen saat pelaksanaan dan servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Saat pelaksanaan	Momen saat servise		Zt	Zb	Tegangan		Tegangan Maks		Tegangan Min	
							Saat pelaksanaan		Saat servise		Saat servise	
		Momen (kNm)	Momen Maks (kNm)	Momen Min (kNm)	(m^3)	(m^3)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
1	0.0	0.0000	0.0000	0.0000	8.1356	5.9928	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	2.5	-1630.2100	10165.4700	2448.0000	8.1541	6.0104	0.1999	-0.2712	-1.2467	1.6913	-0.3002	0.4073
3	5.0	-4541.6700	18556.0900	3463.9800	8.2079	6.0629	0.5533	-0.7491	-2.2608	3.0606	-0.4220	0.5713
4	7.5	-8765.6300	25140.6400	3016.7300	8.2983	6.1514	1.0563	-1.4250	-3.0296	4.0870	-0.3635	0.4904
5	10.0	-14333.3300	29387.8600	1074.9700	8.4248	6.2761	1.7013	-2.2838	-3.5476	4.7622	-0.1276	0.1713
6	12.5	-21276.0400	32766.5000	-2392.5400	8.5882	6.4377	2.4774	-3.3049	-3.8153	5.0898	0.2786	-0.3716
7	15.0	-29625.0000	33745.3000	-7417.0500	8.7892	6.6379	3.3706	-4.4630	-3.8394	5.0837	0.8439	-1.1174
8	17.5	-39411.4600	32793.0300	-14029.8000	9.0288	6.8778	4.3651	-5.7302	-3.6320	4.7680	1.5539	-2.0399
9	20.0	-50666.6700	29878.4100	-22262.0700	9.3066	7.1607	5.4442	-7.0757	-3.2105	4.1726	2.3921	-3.1089
10	22.5	-63421.8700	24970.2200	-32145.0800	9.6238	7.4865	6.5901	-8.4715	-2.5946	3.3354	3.3402	-4.2937
11	25.0	-77708.3300	18037.2100	-43710.0800	9.9821	7.8586	7.7848	-9.8883	-1.8070	2.2952	4.3788	-5.5621
12	27.5	-93557.2900	9048.1000	-56988.3500	10.381	8.2793	9.0124	-11.3001	-0.8716	1.0929	5.4897	-6.8832
13	30.0	-111000.0000	-2028.3300	-72011.1000	10.8232	8.752	10.2557	-12.6828	0.1874	-0.2318	6.6534	-8.2280
14	32.5	-130067.7100	-15223.3500	-88809.6100	11.3092	9.2794	11.5011	-14.0168	1.3461	-1.6406	7.8529	-9.5706
15	35.0	-150791.6700	-30568.1900	-107415.1200	11.8404	9.8646	12.7354	-15.2861	2.5817	-3.0988	9.0719	-10.8889
16	37.5	-173203.1300	-48921.5300	-127858.8700	12.4183	10.5113	13.9474	-16.4778	3.9395	-4.6542	10.2960	-12.1639
17	40.0	-197333.3300	-69487.2200	-150172.1300	13.0447	11.2227	15.1275	-16.8450	5.3269	-6.1917	11.5121	-13.3811
18	42.5	-223213.5400	-92296.4700	-174386.1400	13.7214	12.0038	16.2675	-17.2150	6.7265	-7.6889	12.7091	-14.5276
19	45.0	-250875.0000	-117380.5700	-200532.1500	14.4501	12.858	17.3615	-17.5320	8.1232	-9.1290	13.8776	-15.5959
20	47.5	-280348.9600	-144770.7400	-228641.4000	15.232	13.7901	18.4053	-17.9510	9.5044	-10.4982	15.0106	-16.5801
21	50.0	-311666.6700	-174498.2500	-258745.1700	16.0705	14.8048	19.3937	-18.3100	10.8583	-11.7866	16.1006	-17.4771
22	52.5	-344859.3700	-206594.3300	-290874.6700	16.9672	15.9068	20.3251	-18.5460	12.1761	-12.9878	17.1434	-18.2862
23	55.0	-379958.3300	-241090.2400	-325061.1700	17.9244	17.1002	21.1978	-18.8550	13.4504	-14.0987	18.1351	-19.0092
24	57.5	-416994.7900	-278017.2500	-361335.9400	18.9444	18.392	22.0115	-19.1560	14.6754	-15.1162	19.0735	-19.6464
25	60.0	-456000.0000	-317406.5800	-399730.2000	20.0298	19.786	22.7661	-19.4850	15.8467	-16.0420	19.9568	-20.2027

Lanjutan tabel 4.12 Tegangan saat layan akibat momen saat pelaksanaan dan servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Saat pelaksanaan	Momen saat servise		Zt	Zb	Tegangan		Tegangan Maks		Tegangan Min	
			Momen Maks	Momen Min	(m^3)	(m^3)	Saat pelaksanaan		Saat servise		Saat servise	
		Momen (kNm)	(kNm)	(kNm)			f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
26	62.5	-497005.2100	-355836.3800	-440608.4100	21.1831	21.2903	23.4623	-20.2740	16.7981	-16.7135	20.8000	-20.6953
27	65.0	-540041.6700	-395159.8800	-488268.9000	22.4073	22.9074	24.1011	-20.8560	17.6353	-17.2503	21.7906	-21.3149
28	67.5	-585140.6300	-436696.6400	-538485.4900	23.7056	24.6449	24.6836	-21.5620	18.4217	-17.7196	22.7155	-21.8498
29	70.0	-632333.3300	-480477.8800	-591289.3900	25.0803	26.5105	25.2124	-22.0560	19.1576	-18.1241	23.5758	-22.3040
30	72.5	-585140.6200	-438292.6900	-532148.4300	23.7056	24.6449	24.6836	-22.0450	18.4890	-17.7843	22.4482	-21.5926
31	75.0	-540041.6700	-390483.4400	-475541.9900	22.4073	22.9074	24.1011	-21.8630	17.4266	-17.0462	21.2226	-20.7593
32	77.5	-497005.2100	-344387.4500	-421438.8000	21.1831	21.2903	23.4623	-21.3150	16.2813	-16.1993	19.8950	-19.7949
33	80.0	-456000.0000	-301473.4600	-369807.6400	20.0298	19.786	22.7661	-20.9740	15.0512	-15.2367	18.4629	-18.6904
34	82.5	-416994.7900	-260210.2200	-320617.2300	18.9444	18.392	22.0115	-20.4660	13.7355	-14.1480	16.9241	-17.4324
35	85.0	-379958.3300	-221066.4700	-273836.3400	17.9244	17.1002	21.1978	-19.9860	12.3333	-12.9277	15.2773	-16.0136
36	87.5	-344859.3700	-184010.9800	-229433.7000	16.9672	15.9068	20.3251	-19.4250	10.8451	-11.5681	13.5222	-14.4236
37	90.0	-311666.6700	-149012.4900	-187378.0800	16.0705	14.8048	19.3937	-19.0870	9.2724	-10.0651	11.6598	-12.6566
38	92.5	-280348.9600	-116039.7600	-147638.2300	15.232	13.7901	18.4053	-18.8420	7.6182	-8.4147	9.6926	-10.7061
39	95.0	-250875.0000	-85061.5100	-110182.8800	14.4501	12.858	17.3615	-18.4760	5.8866	-6.6155	7.6251	-8.5692
40	97.5	-223213.5400	-56046.5200	-74980.8000	13.7214	12.0038	16.2675	-18.0950	4.0846	-4.6691	5.4645	-6.2464
41	100.0	-197333.3300	-28963.5200	-42000.7300	13.0447	11.2227	15.1275	-17.5834	2.2203	-2.5808	3.2198	-3.7425
42	102.5	-173203.1200	1848.8300	-14504.9000	12.4183	10.5113	13.9474	-16.4778	-0.1489	0.1759	1.1680	-1.3799
43	105.0	-150791.6700	29607.9400	9527.7700	11.8404	9.8646	12.7354	-15.2861	-2.5006	3.0014	-0.8047	0.9659
44	107.5	-130067.7100	55238.7900	31722.1900	11.3092	9.2794	11.5011	-14.0168	-4.8844	5.9528	-2.8050	3.4186
45	110.0	-111000.0000	78772.6200	52109.6100	10.8232	8.752	10.2557	-12.6828	-7.2781	9.0005	-4.8146	5.9540
46	112.5	-93557.2900	100240.7000	70721.3000	10.381	8.2793	9.0124	-11.3001	-9.6562	12.1074	-6.8126	8.5419
47	115.0	-77708.3300	119674.2600	87588.4700	9.9821	7.8586	7.7848	-9.8883	-11.9889	15.2284	-8.7746	11.1456
48	117.5	-63421.8700	137159.0900	102687.8800	9.6238	7.4865	6.5901	-8.4715	-14.2521	18.3209	-10.6702	13.7164
49	120.0	-50666.6700	153052.7000	115724.4500	9.3066	7.1607	5.4442	-7.0757	-16.4456	21.3740	-12.4347	16.1611
50	122.5	-39411.4600	167005.5700	127110.2900	9.0288	6.8778	4.3651	-5.7302	-18.4970	24.2818	-14.0783	18.4812

Lanjutan tabel 4.12 Tegangan saat layan akibat momen saat pelaksanaan dan servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Saat pelaksanaan	Momen saat servise		Zt	Zb	Tegangan		Tegangan Maks		Tegangan Min	
							Saat pelaksanaan		Saat servise		Saat servise	
		Momen (kNm)	Momen Maks (kNm)	Momen Min (kNm)	(m^3)	(m^3)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
51	125.0	-29625.0000	179048.9200	136876.6200	8.7892	6.6379	3.3706	-4.4630	-20.3715	26.9737	-15.5733	20.6205
52	127.5	-21276.0400	189214.0200	145054.7100	8.5882	6.4377	2.4774	-3.3049	-22.0319	29.3916	-16.8900	22.5321
53	130.0	-14333.3300	197532.1000	151675.7900	8.4248	6.2761	1.7013	-2.2838	-23.4465	31.4737	-18.0035	24.1672
54	132.5	-8765.6200	204034.4200	156771.1300	8.2983	6.1514	1.0563	-1.4250	-24.5875	33.1688	-18.8920	25.4854
55	135.0	-4541.6700	208752.2100	160371.9500	7.489	5.5318	0.6064	-0.8210	-27.8745	37.7368	-21.4143	28.9909
56	137.5	-1630.2100	211716.7600	162509.5400	7.3956	5.4514	0.2204	-0.2990	-28.6274	38.8371	-21.9738	29.8106
57	140.0	0.0000	212959.2800	163215.1200	7.4171	5.4635	0.0000	0.0000	-28.7119	38.9785	-22.0052	29.8737
58	142.5	-1630.2100	211716.7600	162509.5400	7.4756	5.5103	0.2181	-0.2958	-28.3210	38.4220	-21.7387	29.4920
59	145.0	-4541.6700	208752.2100	160371.9500	7.5709	5.5923	0.5999	-0.8121	-27.5730	37.3285	-21.1827	28.6773
60	147.5	-8765.6200	204034.4100	156771.1200	7.7041	5.7109	1.1378	-1.5349	-26.4839	35.7272	-20.3491	27.4512
61	150.0	-14333.3300	197532.1000	151675.7900	7.8752	5.8667	1.8201	-2.4432	-25.0828	33.6701	-19.2599	25.8537
62	152.5	-21276.0400	189214.0200	145054.7100	8.0851	6.0606	2.6315	-3.5106	-23.4028	31.2203	-17.9410	23.9341
63	155.0	-29625.0000	179048.9200	136876.6200	8.335	6.2949	3.5543	-4.7062	-21.4816	28.4435	-16.4219	21.7440
64	157.5	-39411.4600	167005.5700	127110.2900	8.6255	6.5705	4.5692	-5.9982	-19.3618	25.4175	-14.7366	19.3456
65	160.0	-50666.6700	153052.7000	115724.4500	8.9571	6.8917	5.6566	-7.3518	-17.0873	22.2083	-12.9199	16.7919
66	162.5	-63421.8700	137159.0800	102687.8700	9.331	7.2587	6.7969	-8.7374	-14.6993	18.8958	-11.0050	14.1469
67	165.0	-77708.3300	119293.4400	87588.4700	9.7488	7.675	7.9711	-10.1249	-12.2367	15.5431	-8.9845	11.4122
68	167.5	-93557.2900	100240.7000	70721.3000	10.2103	8.1431	9.1630	-11.4891	-9.8176	12.3099	-6.9265	8.6848
69	170.0	-111000.0000	78772.6200	52109.6200	10.718	8.6669	10.3564	-12.8073	-7.3496	9.0889	-4.8619	6.0125
70	172.5	-130067.7100	55238.7800	31722.1900	11.2732	9.2499	11.5378	-14.0615	-4.9000	5.9718	-2.8139	3.4295
71	175.0	-150791.6700	29607.9300	9527.7600	11.8772	9.8953	12.6959	-15.2387	-2.4928	2.9921	-0.8022	0.9629
72	177.5	-173203.1200	1848.8200	-14504.9100	12.5314	10.607	13.8215	-16.3291	-0.1475	0.1743	1.1575	-1.3675
73	180.0	-197333.3300	-28069.8100	-42000.7400	13.2373	11.3884	14.9074	-16.8450	2.1205	-2.4648	3.1729	-3.6880
74	182.5	-223213.5400	-53408.3900	-74980.8000	13.9976	12.2455	15.9466	-17.2150	3.8155	-4.3615	5.3567	-6.1231
75	185.0	-250875.0000	-82272.6400	-110182.8900	14.8142	13.182	16.9348	-17.6320	5.5536	-6.2413	7.4377	-8.3586

Lanjutan tabel 4.12 Tegangan saat layan akibat momen saat pelaksanaan dan servise tiap segmen tumpuan A - D

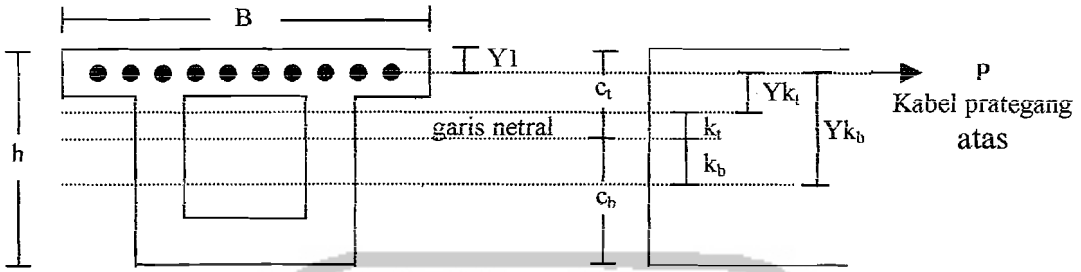
No nodal	Jarak (m)	Saat pelaksanaan	Momen saat servise		Zt (m^3)	Zb (m^3)	Tegangan		Tegangan Maks		Tegangan Min	
							Saat pelaksanaan		Saat servise		Saat servise	
		Momen (kNm)	Momen Maks (kNm)	Momen Min (kNm)			f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
76	187.5	-280348.9600	-113100.1300	-147638.2300	15.6872	14.2023	17.8712	-17.9510	7.2097	-7.9635	9.4114	-10.3954
77	190.0	-311666.6700	-145922.1300	-187378.0900	16.6212	15.3121	18.7512	-18.3100	8.7793	-9.5299	11.2734	-12.2373
78	192.5	-344859.3700	-180769.8600	-229433.7100	17.6182	16.5171	19.5740	-18.5460	10.2604	-10.9444	13.0225	-13.8907
79	195.0	-379958.3300	-217674.6100	-273836.3500	18.6793	17.8204	20.3411	-18.8550	11.6533	-12.2149	14.6599	-15.3665
80	197.5	-416994.7900	-256667.5900	-320617.2300	19.809	19.2314	21.0508	-19.1560	12.9571	-13.3463	16.1854	-16.6715
81	200.0	-456000.0000	-297780.0900	-369807.6400	21.0075	20.7518	21.7065	-19.4850	14.1749	-14.3496	17.6036	-17.8205
82	202.5	-497005.2100	-341043.3300	-421438.8100	21.1831	21.2903	23.4623	-20.2740	16.0998	-16.0187	19.8950	-19.7949
83	205.0	-540041.6700	-386488.5800	-475542.0000	22.4073	22.9074	24.1011	-20.8560	17.2483	-16.8718	21.2226	-20.7593
84	207.5	-585140.6200	-434147.0700	-532148.4400	23.7056	24.6449	24.6836	-21.5620	18.3141	-17.6161	22.4482	-21.5926
85	210.0	-632333.3300	-484050.0600	-591289.4000	25.0803	26.5105	25.2124	-22.0560	19.3000	-18.2588	23.5759	-22.3040
86	212.5	-585140.6300	-440118.0600	-538485.4900	23.7056	24.6449	24.6836	-22.0450	18.5660	-17.8584	22.7155	-21.8498
87	215.0	-540041.6700	-398430.5600	-488268.9100	22.4073	22.9074	24.1011	-21.8630	17.7813	-17.3931	21.7906	-21.3149
88	217.5	-497005.2100	-358956.3000	-440608.4100	21.1831	21.2903	23.4623	-21.3150	16.9454	-16.8601	20.8000	-20.6953
89	220.0	-456000.0000	-317406.5900	-399730.2100	20.0298	19.786	22.7661	-20.9740	15.8467	-16.0420	19.9568	-20.2027
90	222.5	-416994.7900	-278017.2500	-361335.9500	18.9444	18.392	22.0115	-20.4660	14.6754	-15.1162	19.0735	-19.6464
91	225.0	-379958.3300	-241090.2600	-325061.1900	17.9244	17.1002	21.1978	-19.9860	13.4504	-14.0987	18.1351	-19.0092
92	227.5	-344859.3700	-206594.3300	-290874.6700	16.9672	15.9068	20.3251	-19.4250	12.1761	-12.9878	17.1434	-18.2862
93	230.0	-311666.6700	-174498.2500	-258745.1700	16.0705	14.8048	19.3937	-19.0870	10.8583	-11.7866	16.1006	-17.4771
94	232.5	-280348.9600	-144770.7500	-228641.4100	15.232	13.7901	18.4053	-18.8420	9.5044	-10.4982	15.0106	-16.5801
95	235.0	-250875.0000	-117380.5700	-200532.1500	14.4501	12.858	17.3615	-18.4760	8.1232	-9.1290	13.8776	-15.5959
96	237.5	-223213.5400	-92296.4800	-174386.1500	13.7214	12.0038	16.2675	-18.0950	6.7265	-7.6889	12.7091	-14.5276
97	240.0	-197333.3300	-69487.2100	-150172.1300	13.0447	11.2227	15.1275	-17.5834	5.3269	-6.1917	11.5121	-13.3811
98	242.5	-173203.1300	-48921.5400	-127858.8800	12.4183	10.5113	13.9474	-16.4778	3.9395	-4.6542	10.2960	-12.1639
99	245.0	-150791.6700	-30568.1900	-107415.1200	11.8404	9.8646	12.7354	-15.2861	2.5817	-3.0988	9.0719	-10.8889
100	247.5	-130067.7100	-15223.3500	-88809.6100	11.3092	9.2794	11.5011	-14.0168	1.3461	-1.6406	7.8529	-9.5706

Lanjutan tabel 4.12 Tegangan saat layan akibat momen saat pelaksanaan dan servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Saat pelaksanaan	Momen saat servise		Zt	Zb	Tegangan		Tegangan Maks		Tegangan Min	
							Saat pelaksanaan		Saat servise		Saat servise	
		Momen (kNm)	Momen Maks (kNm)	Momen Min (kNm)	(m^3)	(m^3)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
101	250.0	-111000.0000	-2028.3300	-72011.1000	10.8232	8.752	10.2557	-12.6828	0.1874	-0.2318	6.6534	-8.2280
102	252.5	-93557.2900	9048.1000	-56988.3500	10.381	8.2793	9.0124	-11.3001	-0.8716	1.0929	5.4897	-6.8832
103	255.0	-77708.3300	18037.2000	-43710.0900	9.9821	7.8586	7.7848	-9.8883	-1.8070	2.2952	4.3788	-5.5621
104	257.5	-63421.8700	24970.2200	-32145.0800	9.6238	7.4865	6.5901	-8.4715	-2.5946	3.3354	3.3402	-4.2937
105	260.0	-50666.6700	29878.4100	-22262.0800	9.3066	7.1607	5.4442	-7.0757	-3.2105	4.1726	2.3921	-3.1089
106	262.5	-39411.4600	32793.0300	-14029.8000	9.0288	6.8778	4.3651	-5.7302	-3.6320	4.7680	1.5539	-2.0399
107	265.0	-29625.0000	33745.3000	-7417.0500	8.7892	6.6379	3.3706	-4.4630	-3.8394	5.0837	0.8439	-1.1174
108	267.5	-21276.0400	32766.5000	-2392.5400	8.5882	6.4377	2.4774	-3.3049	-3.8153	5.0898	0.2786	-0.3716
109	270.0	-14333.3300	29887.8600	1074.9700	8.4248	6.2761	1.7013	-2.2838	-3.5476	4.7622	-0.1276	0.1713
110	272.5	-8765.6300	25140.6500	3016.7300	8.2983	6.1514	1.0563	-1.4250	-3.0296	4.0870	-0.3635	0.4904
111	275.0	-4541.6700	18556.0900	3463.9800	8.2079	6.0629	0.5533	-0.7491	-2.2608	3.0606	-0.4220	0.5713
112	277.5	-1630.2100	10165.4700	2448.0000	8.1541	6.0104	0.1999	-0.2712	-1.2467	1.6913	-0.3002	0.4073
113	280.0	0.0000	0.0000	0.0000	8.1356	5.9928	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.14 Perhitungan Tegangan Akibat Kabel Tiap Segmen Tumpuan A -D

4.14.1 Saat transfer akibat kabel atas



Mengacu pada formula (3.39) dan (3.40), maka diperoleh ;

Tegangan pada serat atas dan bawah No nodal 2 adalah

$Yk_t = c_t - k_t - Y1 = 1{,}2749 - 0{,}7506 - 0{,}2 = 0{,}3243$ m

$Yk_b = Yk_t + k_t + k_b = 0{,}3243 + 0{,}7506 + 1{,}0183 = -2{,}0932$ m

$Mk_t = P.\ Yk_t = 4375 . 0{,}3243 = 1418{,}8125$ kNm

$Mk_b = P.\ Yk_b = 4375 . -2{,}0932 = -9157{,}7500$ kNm

$$f\ atas = \frac{Mk_b(transfer)}{Z_t} = \frac{1418{,}8125.10^6}{8{,}1541.10^9}$$

$$= -1{,}1231\ Mpa$$

$$f\ bawah = \frac{Mk_t(transfer)}{Z_b} = \frac{9157{,}7500.10^6}{6{,}009.10^9}$$

$$= 0{,}2361\ Mpa$$

Untuk tegangan akibat kabel atas selanjutnya dapat dilihat pada tabel 4.13

Tabel 4.13 Tegangan saat transfer akibat kabel atas tiap segmen tumpuan A - D

No Nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
1	57	57	113				1.2725	1.7275	0.7491	1.0170			8.1356	5.9928				
2	56	58	112	28	4375	0.2	1.2749	1.7296	0.7506	1.0183	0.3243	-2.0932	8.1541	6.0104	1418.8125	-9157.7500	-1.1231	0.2361
3	55	59	111	28,15	8750	0.2	1.2821	1.7357	0.7552	1.0223	0.3269	-2.1044	8.2079	6.0629	2860.3750	-18413.5000	-2.2434	0.4718
4	54	60	110	28,15,27	13125	0.2	1.2942	1.7459	0.7628	1.0290	0.3314	-2.1232	8.2983	6.1514	4349.6250	-27867.0000	-3.3582	0.7071
5	53	61	109	28,15,27,16	17500	0.2	1.3112	1.7601	0.7735	1.0383	0.3377	-2.1495	8.4248	6.2761	5909.7500	-37616.2500	-4.4649	0.9416
6	52	62	108	28,15,27, 16,26	21875	0.2	1.3330	1.7783	0.7872	1.0501	0.3458	-2.1831	8.5882	6.4377	7564.3750	-47755.3125	-5.5606	1.1750
7	51	63	107	28,15,27, 16,26,17	26250	0.2	1.3598	1.8005	0.8040	1.0645	0.3558	-2.2243	8.7892	6.6379	9339.7500	-58387.8750	-6.6431	1.4070
8	50	64	106	28,15,27, 16,26,17,25	30625	0.2	1.3915	1.8267	0.8238	1.0814	0.3677	-2.2729	9.0288	6.8778	11260.8125	-69607.5625	-7.7095	1.6373
9	49	65	105	28,15,27, 16,26,17, 25,18	35000	0.2	1.4285	1.8566	0.8468	1.1006	0.3817	-2.3291	9.3066	7.1607	13359.5000	-81518.5000	-8.7592	1.8657
10	48	66	104	28,15,27, 16,26,17, 25,18,24	39375	0.2	1.4705	1.8903	0.8728	1.1220	0.3977	-2.3925	9.6238	7.4865	15659.4375	-94204.6875	-9.7887	2.0917
11	47	67	103	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	1.5177	1.9278	0.9020	1.1457	0.4157	-2.4634	9.9821	7.8586	18186.8750	-107773.7500	-10.7967	2.3143
12	46	68	102	28,15,27, 16,26,17,19	43750	0.2	1.5702	1.9688	0.9342	1.1713	0.4360	-2.5415	10.3810	8.2793	19075.0000	-111190.6250	-10.7110	2.3039

Lanjutan tabel 4.13 Tegangan saat transfer akibat kabel atas tiap segmen tumpuan A - D

No Nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				25,18,24, 5,38	8750	0.5	1.5702	1.9688	0.9342	1.1713	0.1860	-2.2915	10.3810	8.2793	1627.5000	-20050.6250	-1.9315	0.1966
																	-12.6424	2.5005
13	45	69	101	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	1.6281	2.0134	0.9696	1.1991	0.4585	-2.6272	10.8232	8.7520	20059.3750	-114940.0000	-10.6198	2.2920
				5,38	8750	0.2	1.6281	2.0134	0.9696	1.1991	0.4585	-2.6272	10.8232	8.7520	4011.8750	-22988.0000	-2.1240	0.4584
				6,37	8750	0.5	1.6281	2.0134	0.9696	1.1991	0.2085	-2.3772	10.8232	8.7520	824.3750	-20800.5000	-1.9218	0.2085
																	-14.6656	2.9588
14	44	70	100	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	1.6915	2.0615	1.0081	1.2286	0.4834	-2.7201	11.3092	9.2794	21148.7500	-119004.3750	-10.5228	2.2791
				5,38,6,37	17500	0.2	1.6915	2.0615	1.0081	1.2286	0.4834	-2.7201	11.3092	9.2794	8459.5000	-47601.7500	-4.2091	0.9116
				7,36	8750	0.5	1.6915	2.0615	1.0081	1.2286	0.2334	-2.4701	11.3092	9.2794	2042.2500	-21613.3750	-1.9111	0.2201
																	-16.6430	3.4108
15	43	71	99	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	1.7604	2.1130	1.0497	1.2600	0.5107	-2.8204	11.8404	9.8646	22343.1250	-123392.5000	-10.4213	2.2650
				5,38,6,37	17500	0.2	1.7604	2.1130	1.0497	1.2600	0.5107	-2.8204	11.8404	9.8646	8937.2500	-49357.0000	-4.1685	0.9060
				7,36,23	13125	0.2	1.7604	2.1130	1.0497	1.2600	0.5107	-2.8204	11.8404	9.8646	6702.9375	-37017.7500	-3.1264	0.6795
																	-17.7162	3.8505
16	42	72	98	28,15,27, 16,26,17,19	43750	0.2	1.8349	2.1678	1.0944	1.2930	0.5405	-2.9279	12.4183	10.5113	23646.8750	-128095.6250	-10.3151	2.2497

Lanjutan tabel 4.13 Tegangan saat transfer akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				25,18,24,														
				5,38,6,37	17500	0.2	1.8349	2.1678	1.0944	1.2930	0.5405	-2.9279	12.4183	10.5113	9458.7500	-51238.2500	-4.1260	0.8999
				7,36,23	13125	0.2	1.8349	2.1678	1.0944	1.2930	0.5405	-2.9279	12.4183	10.5113	7094.0625	-38428.6875	-3.0945	0.6749
				8,35	8750	0.5	1.8349	2.1678	1.0944	1.2930	0.2905	-2.6779	12.4183	10.5113	2541.8750	-23431.6250	-1.8869	0.2418
																	-19.4225	4.0662
17	41	73	97	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	1.9150	2.2259	1.1422	1.3277	0.5728	-3.0427	13.0447	11.2227	25060.0000	-133118.1250	-10.2048	2.2330
				5,38,6,37	17500	0.2	1.9150	2.2259	1.1422	1.3277	0.5728	-3.0427	13.0447	11.2227	10024.0000	-53247.2500	-4.0819	0.8932
				7,36,23,	13125	0.2	1.9150	2.2259	1.1422	1.3277	0.5728	-3.0427	13.0447	11.2227	7518.0000	-39935.4375	-3.0614	0.6699
				8,35	8750	0.2	1.9150	2.2259	1.1422	1.3277	0.5728	-3.0427	13.0447	11.2227	5012.0000	-26623.6250	-2.0410	0.4466
				9,34	8750	0.5	1.9150	2.2259	1.1422	1.3277	0.3228	-2.7927	13.0447	11.2227	2824.5000	-24436.1250	-1.8733	0.2517
																	-21.2623	4.4943
18	40	74	96	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	2.0009	2.2872	1.1931	1.3638	0.6078	-3.1647	13.7214	13.0038	26591.2500	-138455.6250	-10.0905	2.0449
				5,38,6,37	17500	0.2	2.0009	2.2872	1.1931	1.3638	0.6078	-3.1647	13.7214	13.0038	10636.5000	-55382.2500	-4.0362	0.8180
				7,36,23	13125	0.2	2.0009	2.2872	1.1931	1.3638	0.6078	-3.1647	13.7214	13.0038	7977.3750	-41536.6875	-3.0271	0.6135
				8,35,9,34	17500	0.2	2.0009	2.2872	1.1931	1.3638	0.6078	-3.1647	13.7214	13.0038	10636.5000	-55382.2500	-4.0362	0.8180
				10,33	8750	0.5	2.0009	2.2872	1.1931	1.3638	0.3578	-2.9147	13.7214	13.0038	3130.7500	-25503.6250	-1.8587	0.2408
																	-23.0487	4.5350
19	39	75	95	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	2.0926	2.3517	1.2470	1.4014	0.6456	-3.2940	14.4501	12.8580	28245.0000	-144112.5000	-9.9731	2.1967

Lanjutan tabel 4.13 Tegangan saat transfer akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				5,38,6,37	17500	0.2	2.0926	2.3517	1.2470	1.4014	0.6456	-3.2940	14.4501	12.8580	11298.0000	-57645.0000	-3.9892	0.8787
				7,36,23	13125	0.2	2.0926	2.3517	1.2470	1.4014	0.6456	-3.2940	14.4501	12.8580	8473.5000	-43233.7500	-2.9919	0.6590
				8,35,9,34	17500	0.2	2.0926	2.3517	1.2470	1.4014	0.6456	-3.2940	14.4501	12.8580	11298.0000	-57645.0000	-3.9892	0.8787
				10,33	8750	0.2	2.0926	2.3517	1.2470	1.4014	0.6456	-3.2940	14.4501	12.8580	5649.0000	-28822.5000	-1.9946	0.4393
				14,29	8750	0.5	2.0926	2.3517	1.2470	1.4014	0.3956	-3.0440	14.4501	12.8580	3461.5000	-26635.0000	-1.8432	0.2692
																	-24.7814	5.3216
20	38	76	94	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	30021.2500	-150088.7500	-9.8535	2.1770
				5,38,6,37	17500	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	12008.5000	-60035.5000	-3.9414	0.8708
				7,36,23	13125	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	9006.3750	-45026.6250	-2.9561	0.6531
				8,35,9,34	17500	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	12008.5000	-60035.5000	-3.9414	0.8708
				10,33,14,29	17500	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	12008.5000	-60035.5000	-3.9414	0.8708
				20	4375	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	3002.1250	-15008.8750	-0.9854	0.2177
																	-25.6191	5.6602
21	37	77	93	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	2.2937	2.4698	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	31924.3750	-156380.0000	-9.7309	2.1564
				5,38,6,37	17500	0.2	2.2937	2.4698	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	12769.7500	-62552.0000	-3.8923	0.8625
				7,36,23	13125	0.2	2.2937	2.4698	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	9577.3125	-46914.0000	-2.9193	0.6469
				8,35,9,34	17500	0.2	2.2937	2.4698	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	12769.7500	-62552.0000	-3.8923	0.8625
				10,33,14,29	17500	0.2	2.2937	2.4698	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	12769.7500	-62552.0000	-3.8923	0.8625
				20	4375	0.2	2.2937	2.4698	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	3192.4375	-15638.0000	-0.9731	0.2156
				11,32	8750	0.5	2.2937	2.4698	1.3640	1.4807	0.4797	-3.3244	16.0705	14.8048	4197.3750	-29088.5000	-1.8101	0.2835
																	-27.1103	5.8900

Lanjutan tabel 4.13 Tegangan saat transfer akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
22	36	78	92	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	33954.3750	-162986.2500	-9.6060	2.1346
				5,38,6,37	17500	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	13581.7500	-65194.5000	-3.8424	0.8538
				7,36,23	13125	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	10186.3125	-48895.8750	-2.8818	0.6404
				8,35,9,34	17500	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	13581.7500	-65194.5000	-3.8424	0.8538
				10,33,14,29	17500	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	13581.7500	-65194.5000	-3.8424	0.8538
				20,11,32	13125	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	10186.3125	-48895.8750	-2.8818	0.6404
				13,30.	8750	0.5	2.4032	2.5634	1.4271	1.5222	0.5261	-3.4754	16.9672	15.9068	4603.3750	-30409.7500	-1.7923	0.2894
																	-28.6890	6.2662
23	35	79	91	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	36120.0000	-159898.7500	-9.4786	2.1123
				5,38,6,37	17500	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	14448.0000	-57959.5000	-3.7915	0.8449
				7,36,23	13125	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	10836.0000	-50969.6250	-2.8436	0.6337
				8,35,9,34	17500	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	14448.0000	-57959.5000	-3.7915	0.8449
				10,33,14,29	17500	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	14448.0000	-57959.5000	-3.7915	0.8449
				20,11,32	13125	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	10836.0000	-50969.6250	-2.8436	0.6337
				13,30,22	13125	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	10836.0000	-50969.6250	-2.8436	0.6337
																	-29.3838	6.5480
24	34	80	90	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	2.6402	2.7195	1.5619	1.6088	0.8783	-4.0490	18.9444	18.3920	38425.6250	-177143.7500	-9.3507	2.0893
				5,38,6,37	17500	0.2	2.6402	2.7195	1.5619	1.6088	0.8783	-4.0490	18.9444	18.3920	15370.2500	-70857.5000	-3.7403	0.8357
				7,36,23	13125	0.2	2.6402	2.7195	1.5619	1.6088	0.8783	-4.0490	18.9444	18.3920	11527.6875	-53143.1250	-2.8052	0.6268

Lanjutan tabel 4.13 Tegangan saat transfer akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				8,35,9,34	17500	0.2	2.6402	2.7195	1.5619	1.6088	0.8783	-4.0490	18.9444	18.3920	15370.2500	-70857.5000	-3.7403	0.8357
				10,33,14,29	17500	0.2	2.6402	2.7195	1.5619	1.6088	0.8783	-4.0490	18.9444	18.3920	15370.2500	-70857.5000	-3.7403	0.8357
				20,11,32	13125	0.2	2.6402	2.7195	1.5619	1.6088	0.8783	-4.0490	18.9444	18.3920	11527.6875	-53143.1250	-2.8052	0.6268
				13,30,22	13125	0.2	2.6402	2.7195	1.5619	1.6088	0.8783	-4.0490	18.9444	18.3920	11527.6875	-53143.1250	-2.8052	0.6268
				12.31	8750	0.5	2.6402	2.7195	1.5619	1.6088	0.6283	-3.7990	18.9444	18.3920	5497.6250	-33241.2500	-1.7547	0.2989
																	-30.7419	6.7756
25	33	81	89	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	40866.8750	-184695.0000	-9.2210	2.0654
				5,38,6,37	17500	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	16346.7500	-73878.0000	-3.6884	0.8262
				7,36,23	13125	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	12260.0625	-55408.5000	-2.7663	0.6196
				8,35,9,34	17500	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	16346.7500	-73878.0000	-3.6884	0.8262
				10,33,14,29	17500	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	16346.7500	-73878.0000	-3.6884	0.8262
				20,11,32	13125	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	12260.0625	-55408.5000	-2.7663	0.6196
				13,30,22	13125	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	12260.0625	-55408.5000	-2.7663	0.6196
				12.31	8750	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	8173.3750	-36939.0000	-1.8442	0.4131
				4.39	8750	0.5	2.7678	2.8019	1.6337	1.6538	0.6841	-3.9716	20.0298	19.7860	5985.8750	-34751.5000	-1.7350	0.3025
																	-32.1643	7.1185
26	32	82	88	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	2.9017	2.8871	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	43456.8750	-192565.6250	-9.0905	2.0412
				5,38,6,37	17500	0.2	2.9017	2.8871	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	17382.7500	-77026.2500	-3.6362	0.8165
				7,36,23	13125	0.2	2.9017	2.8871	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	13037.0625	-57769.6875	-2.7272	0.6123
				8,35,9,34	17500	0.2	2.9017	2.8871	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	17382.7500	-77026.2500	-3.6362	0.8165
				10,33,14,29	17500	0.2	2.9017	2.8871	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	17382.7500	-77026.2500	-3.6362	0.8165

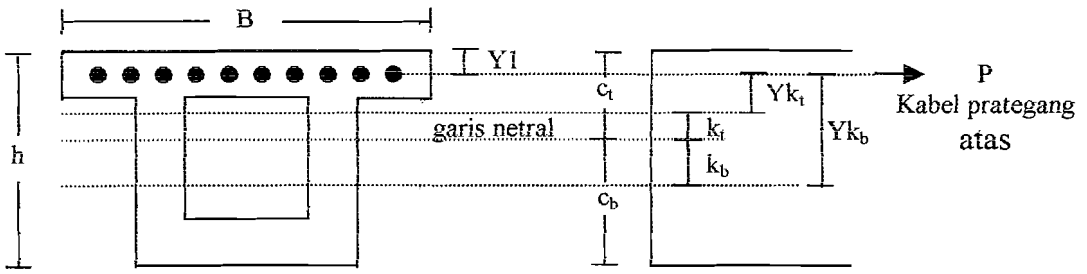
Lanjutan tabel 4.13 Tegangan saat transfer akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				20,11,32	13125	0.2	2.9017	2.8871	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	13037.0625	-57769.6875	-2.7272	0.6123
				13,30,22	13125	0.2	2.9017	2.8871	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	13037.0625	-57769.6875	-2.7272	0.6123
				12,31,21	13125	0.2	2.9017	2.8871	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	13037.0625	-57769.6875	-2.7272	0.6123
				4.39	8750	0.5	2.9017	2.8871	1.7084	1.6998	0.7433	-4.1515	21.1831	21.2903	6503.8750	-36325.6250	-1.7148	0.3055
																	-32.6226	7.2454
27	31	83	87	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	46186.8750	-200746.8750	-8.9590	2.0162
				5,38,6,37	17500	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	18474.7500	-80298.7500	-3.5836	0.8065
				7,36,23	13125	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	13856.0625	-60224.0625	-2.6877	0.6049
				8,35,9,34	17500	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	18474.7500	-80298.7500	-3.5836	0.8065
				10,33,14,29	17500	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	18474.7500	-80298.7500	-3.5836	0.8065
				20,11,32	13125	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	13856.0625	-60224.0625	-2.6877	0.6049
				13,30,22	13125	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	13856.0625	-60224.0625	-2.6877	0.6049
				12,31,21	13125	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	13856.0625	-60224.0625	-2.6877	0.6049
				4.39	8750	0.5	3.0416	2.9752	1.7859	1.7469	0.8057	-4.3385	22.4073	22.9074	7049.8750	-37961.8750	-1.6942	0.3078
				3,40.	8750	0.7	3.0416	2.9752	1.7859	1.7469	0.5557	-4.0885	22.4073	22.9074	4862.3750	-35774.3750	-1.5966	0.2123
																	-33.7513	7.3752
28	30	84	86	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	49065.6250	-209243.1250	-8.8267	1.9909
				5,38,6,37	17500	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	19626.2500	-83697.2500	-3.5307	0.7964
				7,36,23	13125	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	14719.6875	-62772.9375	-2.6480	0.5973
				8,35,9,34	17500	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	19626.2500	-83697.2500	-3.5307	0.7964
				10,33,14,29	17500	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	19626.2500	-83697.2500	-3.5307	0.7964

Lanjutan tabel 4.13 Tegangan saat transfer akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				20,11,32	13125	0.2	3.1877	3.0662	1.8562	1.7950	1.1215	-4.7827	23.7056	24.6449	14719.6875	-52772.9375	-2.6480	0.5973
				13,30,22	13125	0.2	3.1877	3.0662	1.8562	1.7950	1.1215	-4.7827	23.7056	24.6449	14719.6875	-52772.9375	-2.6480	0.5973
				12,31,21	13125	0.2	3.1877	3.0662	1.8562	1.7950	1.1215	-4.7827	23.7056	24.6449	14719.6875	-52772.9375	-2.6480	0.5973
				4.39	8750	0.5	3.1877	3.0662	1.8562	1.7950	0.8715	-4.5327	23.7056	24.6449	7625.6250	-39661.1250	-1.6731	0.3094
				3,40.	8750	0.7	3.1877	3.0662	1.8562	1.7950	0.6215	-4.2827	23.7056	24.6449	5438.1250	-37473.6250	-1.5808	0.2207
				2.41	8750	1	3.1877	3.0662	1.8562	1.7950	0.3715	-4.0327	23.7056	24.6449	3250.6250	-35286.1250	-1.4885	0.1319
																	-34.7533	7.4311
29	29	85	85	28,15,27, 16,26,17,19 25,18,24,	43750	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	52097.5000	-218058.7500	-8.6944	1.9652
				5,38,6,37	17500	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	20839.0000	-87223.5000	-3.4778	0.7861
				7,36,23	13125	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	15629.2500	-65417.6250	-2.6083	0.5895
				8,35,9,34	17500	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	20839.0000	-87223.5000	-3.4778	0.7861
				10,33,14,29	17500	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	20839.0000	-87223.5000	-3.4778	0.7861
				20,11,32	13125	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	15629.2500	-65417.6250	-2.6083	0.5895
				13,30,22	13125	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	15629.2500	-65417.6250	-2.6083	0.5895
				12,31,21	13125	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	15629.2500	-65417.6250	-2.6083	0.5895
				4.39	8750	0.5	3.3401	3.1599	1.9493	1.8441	0.9408	-4.7342	25.0803	26.5105	8232.0000	-41424.2500	-1.6517	0.3105
				3,40.	8750	0.7	3.3401	3.1599	1.9493	1.8441	0.6908	-4.4842	25.0803	26.5105	6044.5000	-39236.7500	-1.5644	0.2280
				2.41	8750	1	3.3401	3.1599	1.9493	1.8441	0.4408	-4.2342	25.0803	26.5105	3857.0000	-37049.2500	-1.4772	0.1455
				1.42	8750	1.2	3.3401	3.1599	1.9493	1.8441	0.1908	-3.9842	25.0803	26.5105	1669.5000	-34861.7500	-1.3900	0.0630
																	-35.6444	7.4285

4.14.2 Saat layan akibat kabel atas



Mengacu pada formula (3.41) dan (3.42), maka diperoleh ;

Tegangan pada serat atas dan bawah No nodal 2 adalah

$Yk_t = c_t - k_t - Y1 = 1{,}7296 - 0{,}7506 - 0{,}2 = 0{,}3243$ m

$Yk_b = Yk_t + k_t + k_b = 0{,}3243 + 0{,}7506 + 1{,}0183 = -2{,}0932$ m

$Mk_t = P.\ Yk_t = 3500 \,.\, 0{,}3243 = 1135{,}0500$ kNm

$Mk_b = P\,.\,Yk_b = 3500 \,.\, -2{,}093 = -7326{,}2000$ kNm

$$f\,\text{atas} = \frac{Mk_b(\text{layan})}{Z_t} = \frac{7326{,}2000.10^6}{8{,}1541.10^9}$$

$$= -0{,}8985 \text{ Mpa}$$

$$f\,\text{bawah} = \frac{Mk_t(\text{layan})}{Z_b} = \frac{1135{,}0500.10^6}{6{,}0104.10^9}$$

$$= 0{,}1888 \text{ Mpa}$$

Untuk tegangan akibat kabel atas selanjutnya dapat dilihat pada tabel 4.14

Tabel 4.14 Tegangan saat layan akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
1	57	57	113				1.2725	1.7275	0.7491	1.0170			8.1356	5.9928				
2	56	58	112	28	3500	0.2	1.2749	1.7296	0.7506	1.0183	0.3243	-2.0932	8.1541	6.0104	1135.0500	-7326.2000	-0.8985	0.1888
3	55	59	111	28,15	7000	0.2	1.2821	1.7357	0.7552	1.0223	0.3269	-2.1044	8.2079	6.0629	2288.3000	-14730.8000	-1.7947	0.3774
4	54	60	110	28,15,27	10500	0.2	1.2942	1.7459	0.7628	1.0290	0.3314	-2.1232	8.2983	6.1514	3479.7000	-22293.6000	-2.6865	0.5657
5	53	61	109	28,15,27,16	14000	0.2	1.3112	1.7601	0.7735	1.0383	0.3377	-2.1495	8.4248	6.2761	4727.8000	-30093.0000	-3.5720	0.7533
6	52	62	108	28,15,27, 16,26	17500	0.2	1.3330	1.7783	0.7872	1.0501	0.3458	-2.1831	8.5882	6.4377	6051.5000	-38204.2500	-4.4485	0.9400
7	51	63	107	28,15,27, 16,26,17	21000	0.2	1.3598	1.8005	0.8040	1.0645	0.3558	-2.2243	8.7892	6.6379	7471.8000	-46710.3000	-5.3145	1.1256
8	50	64	106	28,15,27, 16,26,17,25	24500	0.2	1.3915	1.8267	0.8238	1.0814	0.3677	-2.2729	9.0288	6.8778	9008.6500	-55686.0500	-6.1676	1.3098
9	49	65	105	28,15,27, 16,26,17, 25,18	28000	0.2	1.4285	1.8566	0.8468	1.1006	0.3817	-2.3291	9.3066	7.1607	10687.6000	-65214.8000	-7.0074	1.4925
10	48	66	104	28,15,27, 16,26,17, 25,18,24	31500	0.2	1.4705	1.8903	0.8728	1.1220	0.3977	-2.3925	9.6238	7.4865	12527.5500	-75363.7500	-7.8310	1.6734
11	47	67	103	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	1.5177	1.9278	0.9020	1.1457	0.4157	-2.4634	9.9821	7.8586	14549.5000	-86219.0000	-8.6374	1.8514
12	46	68	102	28,15,27, 16,26,17,19	35000	0.2	1.5702	1.9688	0.9342	1.1713	0.4360	-2.5415	10.3810	8.2793	15260.0000	-88952.5000	-8.5688	1.8432

Lanjutan tabel 4.14 Tegangan saat layan akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				25,18,24, 5.38	7000	0.5	1.5702	1.9688	0.9342	1.1713	0.186	-2.2915	10.3810	8.2793	1302.0000	-16040.5000	-1.5452	0.1573
																	-10.1140	2.0004
13	45	69	101	28,15,27, 16,26,17,19	35000	0.2	1.6281	2.0134	0.9696	1.1991	0.4585	-2.6272	10.8232	8.7520	16047.5000	-91952.0000	-8.4958	1.8336
				25,18,24, 5.38	7000	0.2	1.6281	2.0134	0.9696	1.1991	0.4585	-2.6272	10.8232	8.7520	3209.5000	-18390.4000	-1.6992	0.3667
				6.37	7000	0.5	1.6281	2.0134	0.9696	1.1991	0.2085	-2.3772	10.8232	8.7520	1459.5000	-16640.4000	-1.5375	0.1668
																	-11.7325	2.3671
14	44	70	100	28,15,27, 16,26,17,19	35000	0.2	1.6915	2.0615	1.0081	1.2286	0.4834	-2.7201	11.3092	9.2794	16919.0000	-95203.5000	-8.4182	1.8233
				25,18,24, 5,38,6,37	14000	0.2	1.6915	2.0615	1.0081	1.2286	0.4834	-2.7201	11.3092	9.2794	6767.6000	-38081.4000	-3.3673	0.7293
				7.36	7000	0.5	1.6915	2.0615	1.0081	1.2286	0.2334	-2.4701	11.3092	9.2794	1633.8000	-17290.7000	-1.5289	0.1761
																	-13.3144	2.7287
15	43	71	99	28,15,27, 16,26,17,19	35000	0.2	1.7604	2.1130	1.0497	1.2600	0.5107	-2.8204	11.8404	9.8646	17874.5000	-98714.0000	-8.3370	1.8120
				25,18,24, 5,38,6,37	14000	0.2	1.7604	2.1130	1.0497	1.2600	0.5107	-2.8204	11.8404	9.8646	7149.8000	-39485.6000	-3.3348	0.7248
				7,36,23	10500	0.2	1.7604	2.1130	1.0497	1.2600	0.5107	-2.8204	11.8404	9.8646	5362.3500	-29614.2000	-2.5011	0.5436
																	-14.1730	3.0804
16	42	72	98	28,15,27, 16,26,17,19	35000	0.2	1.8349	2.1678	1.0944	1.2930	0.5405	-2.9279	12.4183	10.5113	18917.5000	-102476.5000	-8.2521	1.7997

Lanjutan tabel 4.14 Tegangan saat layan akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				25,18,24,														
				5,38,6,37	14000	0.2	1.8349	2.1678	1.0944	1.2930	0.5405	-2.9279	12.4183	10.5113	7567.0000	-40990.6000	-3.3008	0.7199
				7,36,23	10500	0.2	1.8349	2.1678	1.0944	1.2930	0.5405	-2.9279	12.4183	10.5113	5675.2500	-30742.9500	-2.4756	0.5399
				8,35	7000	0.5	1.8349	2.1678	1.0944	1.2930	0.2905	-2.6779	12.4183	10.5113	2033.5000	-18745.3000	-1.5095	0.1935
																	-15.5380	3.2530
17	41	73	97	28,15,27,	35000	0.2	1.9150	2.2259	1.1422	1.3277	0.5728	-3.0427	13.0447	11.2227	20048.0000	-106494.5000	-8.1638	1.7864
				16,26,17,19														
				25,18,24,														
				5,38,6,37	14000	0.2	1.9150	2.2259	1.1422	1.3277	0.5728	-3.0427	13.0447	11.2227	8019.2000	-42597.8000	-3.2655	0.7146
				7,36,23,	10500	0.2	1.9150	2.2259	1.1422	1.3277	0.5728	-3.0427	13.0447	11.2227	6014.4000	-31948.3500	-2.4491	0.5359
				8,35	7000	0.2	1.9150	2.2259	1.1422	1.3277	0.5728	-3.0427	13.0447	11.2227	4009.6000	-21298.9000	-1.6328	0.3573
				9,34	7000	0.5	1.9150	2.2259	1.1422	1.3277	0.3228	-2.7927	13.0447	11.2227	2259.6000	-19548.9000	-1.4986	0.2013
																	-17.0099	3.5955
18	40	74	96	28,15,27,	35000	0.2	2.0009	2.2872	1.1931	1.3638	0.6078	-3.1647	13.7214	13.0038	21273.0000	-110764.5000	-8.0724	1.6359
				16,26,17,19														
				25,18,24,														
				5,38,6,37	14000	0.2	2.0009	2.2872	1.1931	1.3638	0.6078	-3.1647	13.7214	13.0038	8509.2000	-44305.8000	-3.2290	0.6544
				7,36,23	10500	0.2	2.0009	2.2872	1.1931	1.3638	0.6078	-3.1647	13.7214	13.0038	6381.9000	-33229.3500	-2.4217	0.4908
				8,35,9,34	14000	0.2	2.0009	2.2872	1.1931	1.3638	0.6078	-3.1647	13.7214	13.0038	8509.2000	-44305.8000	-3.2290	0.6544
				10,33	7000	0.5	2.0009	2.2872	1.1931	1.3638	0.3578	-2.9147	13.7214	13.0038	2504.6000	-20402.9000	-1.4869	0.1926
																	-18.4390	3.6280
19	39	75	95	28,15,27,	35000	0.2	2.0926	2.3517	1.2470	1.4014	0.6456	-3.2940	14.4501	12.8580	22596.0000	-115290.0000	-7.9785	1.7573
				16,26,17,19														
				25,18,24,														

Lanjutan tabel 4.14 Tegangan saat layan akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	c: (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				5,38,6,37	14000	0.2	2.0926	2.3517	1.2470	1.4014	0.6456	-3.2940	14.4501	12.8580	9038.4000	-46116.0000	-3.1914	0.7029
				7,36,23	10500	0.2	2.0926	2.3517	1.2470	1.4014	0.6456	-3.2940	14.4501	12.8580	6778.8000	-34587.0000	-2.3935	0.5272
				8,35,9,34	14000	0.2	2.0926	2.3517	1.2470	1.4014	0.6456	-3.2940	14.4501	12.8580	9038.4000	-46116.0000	-3.1914	0.7029
				10.33	7000	0.2	2.0926	2.3517	1.2470	1.4014	0.6456	-3.2940	14.4501	12.8580	4519.2000	-23058.0000	-1.5957	0.3515
				14.29	7000	0.5	2.0926	2.3517	1.2470	1.4014	0.3956	-3.0440	14.4501	12.8580	2769.2000	-21308.0000	-1.4746	0.2154
																	-19.8251	4.2573
20	38	76	94	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	24017.0000	-120071.0000	-7.8828	1.7416
				5,38,6,37	14000	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	9606.8000	-48028.4000	-3.1531	0.6966
				7,36,23	10500	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	7205.1000	-36021.3000	-2.3648	0.5225
				8,35,9,34	14000	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	9606.8000	-48028.4000	-3.1531	0.6966
				10,33,14,29	14000	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	9606.8000	-48028.4000	-3.1531	0.6966
				20	3500	0.2	2.1902	2.4192	1.3040	1.4404	0.6862	-3.4306	15.2320	13.7901	2401.7000	-12007.1000	-0.7883	0.1742
																	-20.4953	4.5282
21	37	77	93	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	2.2937	2.4898	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	25539.5000	-125104.0000	-7.7847	1.7251
				5,38,6,37	14000	0.2	2.2937	2.4898	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	10215.8000	-50041.6000	-3.1139	0.6900
				7,36,23	10500	0.2	2.2937	2.4898	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	7661.8500	-37531.2000	-2.3354	0.5175
				8,35,9,34	14000	0.2	2.2937	2.4898	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	10215.8000	-50041.6000	-3.1139	0.6900
				10,33,14,29	14000	0.2	2.2937	2.4898	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	10215.8000	-50041.6000	-3.1139	0.6900
				20	3500	0.2	2.2937	2.4898	1.3640	1.4807	0.7297	-3.5744	16.0705	14.8048	2553.9500	-12510.4000	-0.7785	0.1725
				11.32	7000	0.5	2.2937	2.4898	1.3640	1.4807	0.4797	-3.3244	16.0705	14.8048	3357.9000	-23270.8000	-1.4480	0.2268
																	-21.6883	4.7120

Lanjutan tabel 4.14 Tegangan saat layan akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
22	36	78	92	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	27163.5000	-130389.0000	-7.6848	1.7077
				5,38,6,37	14000	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	10865.4000	-52155.6000	-3.0739	0.6831
				7,36,23	10500	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	8149.0500	-39116.7000	-2.3054	0.5123
				8,35,9,34	14000	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	10865.4000	-52155.6000	-3.0739	0.6831
				10,33,14,29	14000	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	10865.4000	-52155.6000	-3.0739	0.6831
				20,11,32	10500	0.2	2.4032	2.5634	1.4271	1.5222	0.7761	-3.7254	16.9672	15.9068	8149.0500	-39116.7000	-2.3054	0.5123
				13,30,	7000	0.5	2.4032	2.5634	1.4271	1.5222	0.5261	-3.4754	16.9672	15.9068	3682.7000	-24327.8000	-1.4338	0.2315
																	-22.9512	5.0130
23	35	79	91	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	28896.0000	-135919.0000	-7.5829	1.6898
				5,38,6,37	14000	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	11558.4000	-54367.6000	-3.0332	0.6759
				7,36,23	10500	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	8668.8000	-40775.7000	-2.2749	0.5069
				8,35,9,34	14000	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	11558.4000	-54367.6000	-3.0332	0.6759
				10,33,14,29	14000	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	11558.4000	-54367.6000	-3.0332	0.6759
				20,11,32	10500	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	8668.8000	-40775.7000	-2.2749	0.5069
				13,30,22	10500	0.2	2.5186	2.6400	1.4930	1.5648	0.8256	-3.8834	17.9244	17.1002	8668.8000	-40775.7000	-2.2749	0.5069
																	-23.5070	5.2384
24	34	80	90	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	2.6402	2.7195	1.5619	1.6088	0.8783	-4.0490	18.9444	18.3920	30740.5000	-141715.0000	-7.4806	1.6714
				5,38,6,37	14000	0.2	2.6402	2.7195	1.5619	1.6088	0.8783	-4.0490	18.9444	18.3920	12296.2000	-56686.0000	-2.9922	0.6686
				7,36,23	10500	0.2	2.6402	2.7195	1.5619	1.6088	0.8783	-4.0490	18.9444	18.3920	9222.1500	-42514.5000	-2.2442	0.5014

Lanjutan tabel 4.14 Tegangan saat layan akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Yt (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				8,35,9,34	14000	0.2	2.6402	2.7195	1.5619	1.6038	0.8783	-4.0490	18.9444	18.3920	12296.2000	-56686.0000	-2.9922	0.6686
				10,33,14,29	14000	0.2	2.6402	2.7195	1.5619	1.6038	0.8783	-4.0490	18.9444	18.3920	12296.2000	-56686.0000	-2.9922	0.6686
				20,11,32	10500	0.2	2.6402	2.7195	1.5619	1.6038	0.8783	-4.0490	18.9444	18.3920	9222.1500	-42514.5000	-2.2442	0.5014
				13,30,22	10500	0.2	2.6402	2.7195	1.5619	1.6038	0.8783	-4.0490	18.9444	18.3920	9222.1500	-42514.5000	-2.2442	0.5014
				12,31	7000	0.5	2.6402	2.7195	1.5619	1.6038	0.6283	-3.7990	18.9444	18.3920	4398.1000	-26593.0000	-1.4037	0.2391
																	-24.5935	5.4205
25	33	81	89	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	32593.5000	-147756.0000	-7.3768	1.6524
				5,38,6,37	14000	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	13077.4000	-59102.4000	-2.9507	0.6609
				7,36,23	10500	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	9808.0500	-44326.8000	-2.2130	0.4957
				8,35,9,34	14000	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	13077.4000	-59102.4000	-2.9507	0.6609
				10,33,14,29	14000	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	13077.4000	-59102.4000	-2.9507	0.6609
				20,11,32	10500	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	9808.0500	-44326.8000	-2.2130	0.4957
				13,30,22	10500	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	9808.0500	-44326.8000	-2.2130	0.4957
				12,31	7000	0.2	2.7678	2.8019	1.6337	1.6538	0.9341	-4.2216	20.0298	19.7860	6538.7000	-29551.2000	-1.4754	0.3305
				4,39	7000	0.5	2.7678	2.8019	1.6337	1.6538	0.6841	-3.9716	20.0298	19.7860	4788.7000	-27801.2000	-1.3880	0.2420
																	-25.7315	5.6948
26	32	82	88	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	2.9017	2.8371	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	34765.5000	-154052.5000	-7.2724	1.6329
				5,38,6,37	14000	0.2	2.9017	2.8371	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	13906.2000	-61621.0000	-2.9090	0.6532
				7,36,23	10500	0.2	2.9017	2.8371	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	10429.6500	-46215.7500	-2.1817	0.4899
				8,35,9,34	14000	0.2	2.9017	2.8371	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	13906.2000	-61621.0000	-2.9090	0.6532
				10,33,14,29	14000	0.2	2.9017	2.8371	1.7084	1.6998	0.9933	-4.4015	21.1831	21.2903	13906.2000	-61621.0000	-2.9090	0.6532

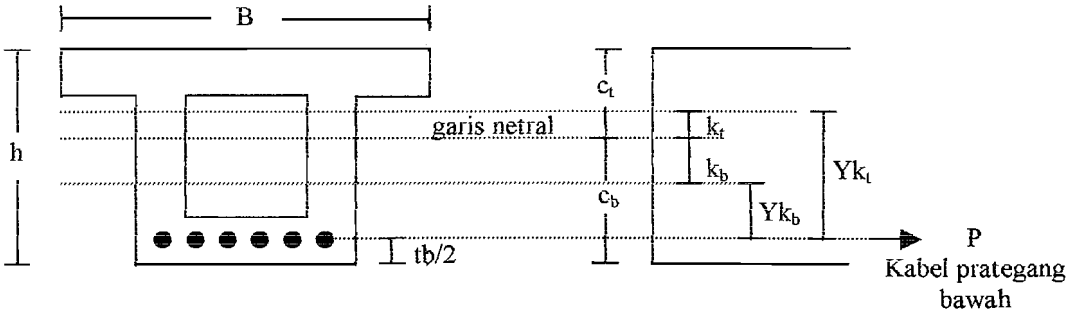
Lanjutan tabel 4.14 Tegangan saat layan akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				20,11,32	10500	0.2	2.9017	2.8871	1.7034	1.6998	0.9933	-4.4015	21.1831	21.2903	10429.6500	-46215.7500	-2.1817	0.4899
				13,30.22	10500	0.2	2.9017	2.8871	1.7034	1.6998	0.9933	-4.4015	21.1831	21.2903	10429.6500	-46215.7500	-2.1817	0.4899
				12,31,21	10500	0.2	2.9017	2.8871	1.7034	1.6998	0.9933	-4.4015	21.1831	21.2903	10429.6500	-46215.7500	-2.1817	0.4899
				4.39	7000	0.5	2.9017	2.8871	1.7034	1.6998	0.7483	-4.1515	21.1831	21.2903	5203.1000	-29060.5000	-1.3719	0.2444
																	-26.0981	5.7963
27	31	83	87	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	36949.5000	-160597.5000	-7.1672	1.6130
				5,38,6,37	14000	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	14779.8000	-64239.0000	-2.8669	0.6452
				7,36,23	10500	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	11084.8500	-48179.2500	-2.1502	0.4839
				8,35,9,34	14000	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	14779.8000	-64239.0000	-2.8669	0.6452
				10,33,14,29	14000	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	14779.8000	-64239.0000	-2.8669	0.6452
				20,11,32	10500	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	11084.8500	-48179.2500	-2.1502	0.4839
				13,30.22	10500	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	11084.8500	-48179.2500	-2.1502	0.4839
				12,31,21	10500	0.2	3.0416	2.9752	1.7859	1.7469	1.0557	-4.5885	22.4073	22.9074	11084.8500	-48179.2500	-2.1502	0.4839
				4.39	7000	0.5	3.0416	2.9752	1.7859	1.7469	0.8057	-4.3385	22.4073	22.9074	5639.9000	-30369.5000	-1.3553	0.2462
				3,40,	7000	0.7	3.0416	2.9752	1.7859	1.7469	0.5557	-4.0885	22.4073	22.9074	3889.9000	-28619.5000	-1.2772	0.1698
																	-27.0010	5.9002
28	30	84	86	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	39252.5000	-167394.5000	-7.0614	1.5927
				5,38,6,37	14000	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	15701.0000	-66957.8000	-2.8246	0.6371
				7,36,23	10500	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	11775.7500	-50218.3500	-2.1184	0.4778
				8,35,9,34	14000	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	15701.0000	-66957.8000	-2.8246	0.6371
				10,33,14,29	14000	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	15701.0000	-66957.8000	-2.8246	0.6371

Lanjutan tabel 4.14 Tegangan saat layan akibat kabel atas tiap segmen tumpuan A - D

No nodal				No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykt (m)	Ykb (m)	Zt (m^3)	Zb (m^3)	Mkt (kNm)	Mkb (kNm)	f atas (Mpa)	f bawah (Mpa)
				20,11,32	10500	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	11775.7500	-50218.3500	-2.1184	0.4778
				13,30,22	10500	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	11775.7500	-50218.3500	-2.1184	0.4778
				12,31,21	10500	0.2	3.1877	3.0662	1.8662	1.7950	1.1215	-4.7827	23.7056	24.6449	11775.7500	-50218.3500	-2.1184	0.4778
				4.39	7000	0.5	3.1877	3.0662	1.8662	1.7950	0.8715	-4.5327	23.7056	24.6449	6100.5000	-31728.9000	-1.3385	0.2475
				3,40,	7000	0.7	3.1877	3.0662	1.8662	1.7950	0.6215	-4.2827	23.7056	24.6449	4350.5000	-29978.9000	-1.2646	0.1765
				2.41	7000	1	3.1877	3.0662	1.8662	1.7950	0.3715	-4.0327	23.7056	24.6449	2600.5000	-28228.9000	-1.1908	0.1055
																	-27.8026	5.9448
29	29	85	85	28,15,27, 16,26,17,19 25,18,24,	35000	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	41678.0000	-174447.0000	-6.9555	1.5721
				5,38,6,37	14000	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	16671.2000	-69778.8000	-2.7822	0.6289
				7,36,23	10500	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	12503.4000	-52334.1000	-2.0867	0.4716
				8,35,9,34	14000	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	16671.2000	-69778.8000	-2.7822	0.6289
				10,33,14,29	14000	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	16671.2000	-69778.8000	-2.7822	0.6289
				20,11,32	10500	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	12503.4000	-52334.1000	-2.0867	0.4716
				13,30,22	10500	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	12503.4000	-52334.1000	-2.0867	0.4716
				12,31,21	10500	0.2	3.3401	3.1599	1.9493	1.8441	1.1908	-4.9842	25.0803	26.5105	12503.4000	-52334.1000	-2.0867	0.4716
				4.39	7000	0.5	3.3401	3.1599	1.9493	1.8441	0.9408	-4.7342	25.0803	26.5105	6585.6000	-33139.4000	-1.3213	0.2484
				3,40,	7000	0.7	3.3401	3.1599	1.9493	1.8441	0.6908	-4.4842	25.0803	26.5105	4835.6000	-31389.4000	-1.2516	0.1824
				2.41	7000	1	3.3401	3.1599	1.9493	1.8441	0.4408	-4.2342	25.0803	26.5105	3085.6000	-29639.4000	-1.1818	0.1164
				1.42	7000	1.2	3.3401	3.1599	1.9493	1.8441	0.1908	-3.9842	25.0803	26.5105	1335.6000	-27889.4000	-1.1120	0.0504
																	-28.5155	5.9428

4.14.3 Saat transfer akibat kabel bawah



Mengacu pada formula (3.43) dan (3.44), maka diperoleh ;

Tegangan pada serat atas dan bawah No nodal 2 adalah

$Yk_b = c_b - k_b - tb/2 = 1{,}7296 - 1{,}0183 - 0{,}2003 = 0{,}5108$ m

$Yk_t = Yk_b + k_b + k_t = 0{,}5108 + 1{,}0183 + 0{,}7506 = -2{,}2797$ m

$Mk_b = P.\,Yk_b = 12425 \,.\, 0{,}5108 = 6346{,}6900$ kNm

$Mk_t = P.\,Yk_t = 12425 \,.\, -2{,}2797 = -28325{,}0075$ kNm

$$f\,atas = \frac{Mk_b(transfer)}{Z_t} = \frac{6346{,}6900.10^6}{8{,}5141.10^9}$$

$$= 0{,}7454 \text{ Mpa}$$

$$f\,bawah = \frac{Mk_t(transfer)}{Z_b} = \frac{28325{,}0075.10^6}{6{,}0104.10^9}$$

$$= -4{,}7127 \text{ Mpa}$$

Untuk tegangan akibat kabel bawah selanjutnya dapat dilihat pada tabel 4.15

Tabel 4.15 Tegangan saat transfer akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
1	113				1.2725	1.7275	0.7491	1.0170			8.1356	5.9928				
2	112	1.2	12425	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	6346.6900	-28325.2725	0.74543	-4.71271
3	111	1.2	12425	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	6366.5700	-28452.0075	0.77566	-4.69281
4	110	1.2.3.4	24850	0.2025	1.2942	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	12782.8400	-57309.0700	1.54042	-9.31643
5	109	1.2.3.4	24850	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	12854.9050	-57878.1350	1.52584	-9.2220
6	108	1.2.3.4	24850	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	12939.3950	-58596.3000	1.50665	-9.10206
7	107	1.2.3.4	24850	0.2105	1.3598	1.8005	0.8040	1.0645	0.5255	-2.3940	8.7892	6.6379	13058.6750	-59490.9000	1.48576	-8.96231
8	106	1.2.3.4	24850	0.2145	1.3915	1.8267	0.8238	1.0814	0.5308	-2.4360	9.0288	6.8773	13190.3800	-60534.6000	1.46092	-8.80145
9	105	1.2.3.4	24850	0.219	1.4285	1.8566	0.8468	1.1006	0.5370	-2.4844	9.3066	7.1607	13344.4500	-61737.3400	1.43387	-8.62169
10	104	1.2.3.4	24850	0.224	1.4705	1.8903	0.8728	1.1220	0.5443	-2.5391	9.6238	7.4865	13525.8550	-63096.6350	1.40546	-8.42806
11	103	1.2	12425	0.2295	1.5177	1.9278	0.9020	1.1457	0.5526	-2.6003	9.9821	7.8586	6866.0550	-32308.7275	0.68784	-4.11126
12	102	1.2	12425	0.236	1.5702	1.9688	0.9342	1.1713	0.5615	-2.6670	10.3810	8.2793	6976.6375	-33137.4750	0.67206	-4.00245
13	101				1.6281	2.0134	0.9696	1.1991			10.8232	8.7520				
14	100				1.6915	2.0615	1.0081	1.2286			11.3092	9.2794				

Lanjutan tabel 4.15 Tegangan saat transfer akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
15	99				1.7604	2.1130	1.0497	1.2600			11.8404	9.8646				
16	98				1.8349	2.1678	1.0944	1.2930			12.4183	10.5113				
17	97				1.9150	2.2259	1.1422	1.3277			13.0447	11.2227				
18	96				2.0009	2.2872	1.1931	1.3638			13.7214	12.0038				
19	95				2.0926	2.3517	1.2470	1.4014			14.4501	12.8580				
20	94				2.1902	2.4192	1.3040	1.4404			15.2320	13.7901				
21	93				2.2937	2.4898	1.3640	1.4807			16.0705	14.8048				
22	92				2.4032	2.5634	1.4271	1.5222			16.9672	15.9068				
23	91				2.5186	2.6400	1.4930	1.5649			17.9244	17.1012				
24	90				2.6402	2.7195	1.5619	1.6088			18.9444	18.3920				
25	89				2.7678	2.8019	1.6337	1.6538			20.0298	19.7860				
26	88				2.9017	2.8871	1.7084	1.6998			21.1831	21.2903				
27	87				3.0516	2.9752	1.7859	1.7469			22.4073	22.9074				
28	86				3.1877	3.0662	1.8662	1.7950			23.7056	24.6449				

Lanjutan tabel 4.15 Tegangan saat transfer akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
29	85				3.3401	3.1599	1.9493	1.8441			25.0803	26.5105				
30	84				3.1877	3.0662	1.8662	1.7950			23.7056	24.6449				
31	83				3.0516	2.9752	1.7859	1.7469			22.4073	22.9074				
32	82				2.9017	2.8871	1.7084	1.6998			21.1831	21.2903				
33	81				2.7678	2.8019	1.6337	1.6538			20.0298	19.7860				
34	80				2.6402	2.7195	1.5619	1.6088			18.9444	18.3920				
35	79				2.5186	2.6400	1.4930	1.5649			17.9244	17.1012				
36	78				2.4032	2.5634	1.4271	1.5222			16.9672	15.9068				
37	77				2.2937	2.4898	1.3640	1.4807			16.0705	14.8048				
38	76				2.1902	2.4192	1.3040	1.4404			15.2320	13.7901				
39	75				2.0926	2.3517	1.2470	1.4014			14.4501	12.8580				
40	74				2.0009	2.2872	1.1931	1.3638			13.7214	12.0038				
41	73				1.9150	2.2259	1.1422	1.3277			13.0447	11.2227				
42	72	,10,11	12425	0.2670	1.8349	2.1678	1.0944	1.2930	0.6078	-2.9952	12.4183	10.5113	7551.9150	-37215.3600	0.60813	-3.54051

Lanjutan tabel 4.15 Tegangan saat transfer akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
43	71	,10,11	12425	0.2580	1.7604	2.1130	1.0497	1.2600	0.5950	-2.9047	11.8404	9.8646	7392.8750	-36090.8975	0.62438	-3.65863
44	70	,10,11,9,12	24850	0.2500	1.6915	2.0615	1.0031	1.2286	0.5829	-2.8196	11.3092	9.2794	14485.0650	-70067.0600	1.28082	-7.55082
45	69	,10,11,9,12	24850	0.2430	1.6281	2.0134	0.9636	1.1991	0.5713	-2.7400	10.8232	8.7520	14196.8050	-68089.0000	1.3117	-7.77982
		8,13	12425	0.2430	1.6281	2.0134	0.9636	1.1991	0.5713	-2.7400	10.8232	8.7520	7098.4025	-34044.5000	0.65585	-3.88991
															1.96755	-11.6697
46	68	,10,11,9,12	24850	0.2360	1.5702	1.9688	0.9342	1.1713	0.5615	-2.6670	10.3810	8.2793	13953.2750	-66274.9500	1.34412	-8.0049
		8,13,7,14	24850	0.2360	1.5702	1.9688	0.9342	1.1713	0.5615	-2.6670	10.3810	8.2793	13953.2750	-66274.9500	1.34412	-8.0049
															2.68823	-16.0098
47	67	,10,11,9,12	24850	0.2295	1.5177	1.9278	0.9020	1.1457	0.5526	-2.6003	9.9821	7.8586	13732.1100	-64617.4550	1.37567	-8.22251
		8,13,7,14	24850	0.2295	1.5177	1.9278	0.9020	1.1457	0.5526	-2.6003	9.9821	7.8586	13732.1100	-64617.4550	1.37567	-8.22251
		6,15	12425	0.2295	1.5177	1.9278	0.9020	1.1457	0.5526	-2.6003	9.9821	7.8586	6866.0550	-32308.7275	0.68784	-4.11126
															3.43918	-20.5563
48	66	,10,11,9,12	24850	0.2240	1.4735	1.8903	0.8728	1.1220	0.5443	-2.5391	9.6238	7.4865	13525.8550	-63096.6350	1.40546	-8.42806
		8,13,7,14	24850	0.2240	1.4735	1.8903	0.8728	1.1220	0.5443	-2.5391	9.6238	7.4865	13525.8550	-63096.6350	1.40546	-8.42806
		6,15,5,16	24850	0.2240	1.4735	1.8903	0.8728	1.1220	0.5443	-2.5391	9.6238	7.4865	13525.8550	-63096.6350	1.40546	-8.42806
															4.21638	-25.2642
49	65	,10,11,9,12	24850	0.2190	1.4285	1.8566	0.8468	1.1006	0.5370	-2.4844	9.3066	7.1607	13344.4500	-61737.3400	1.43387	-8.62169
		8,13,7,14	24850	0.2190	1.4285	1.8566	0.8468	1.1006	0.5370	-2.4844	9.3066	7.1607	13344.4500	-61737.3400	1.43387	-8.62169
		6,15,5,16	24850	0.2190	1.4285	1.8566	0.8468	1.1006	0.5370	-2.4844	9.3066	7.1607	13344.4500	-61737.3400	1.43387	-8.62169
		4,17	12425	0.2190	1.4285	1.8566	0.8468	1.1006	0.5370	-2.4844	9.3066	7.1607	6672.2250	-30868.6700	0.71693	-4.31085
															5.01854	-30.1759

Lanjutan tabel 4.15 Tegangan saat transfer akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
50	64	,10,11,9,12	24850	0.2145	1.3915	1.8267	0.8238	1.0814	0.5308	-2.4360	9.0288	6.8778	13190.3800	-60534.6000	1.46092	-8.80145
		8,13,7,14	24850	0.2145	1.3915	1.8267	0.8238	1.0814	0.5308	-2.4360	9.0288	6.8778	13190.3800	-60534.6000	1.46092	-8.80145
		6,15,5,16	24850	0.2145	1.3915	1.8267	0.8238	1.0814	0.5308	-2.4360	9.0288	6.8778	13190.3800	-60534.6000	1.46092	-8.80145
		4,17,3,18	24850	0.2145	1.3915	1.8267	0.8238	1.0814	0.5308	-2.4360	9.0288	6.8778	13190.3800	-60534.6000	1.46092	-8.80145
															5.8388	-35.2058
51	63	,10,11,9,12	24850	0.2105	1.3598	1.8005	0.8040	1.0645	0.5255	-2.3940	8.7892	6.6379	13058.6750	-59490.9000	1.48576	-8.96231
		8,13,7,14	24850	0.2105	1.3598	1.8005	0.8040	1.0645	0.5255	-2.3940	8.7892	6.6379	13058.6750	-59490.9000	1.48576	-8.96231
		6,15,5,16	24850	0.2105	1.3598	1.8005	0.8040	1.0645	0.5255	-2.3940	8.7892	6.6379	13058.6750	-59490.9000	1.48576	-8.96231
		4,17,3,18	24850	0.2105	1.3598	1.8005	0.8040	1.0645	0.5255	-2.3940	8.7892	6.6379	13058.6750	-59490.9000	1.48576	-8.96231
															5.9452	-35.8492
52	62	,10,11,9,12	24850	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	12939.3950	-58596.3000	1.50665	-9.10206
		8,13,7,14	24850	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	12939.3950	-58596.3000	1.50665	-9.10206
		6,15,5,16	24850	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	12939.3950	-58596.3000	1.50665	-9.10206
		4,17,3,18	24850	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	12939.3950	-58596.3000	1.50665	-9.10206
		2,19	12425	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	6469.6975	-29298.1500	0.75332	-4.55103
															6.7792	-40.9592
53	61	,10,11,9,12	24850	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	12854.9050	-57878.1350	1.52584	-9.22199
		8,13,7,14	24850	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	12854.9050	-57878.1350	1.52584	-9.22199
		6,15,5,16	24850	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	12854.9050	-57878.1350	1.52584	-9.22199
		4,17,3,18	24850	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	12854.9050	-57878.1350	1.52584	-9.22199
		2,19	12425	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	6427.4525	-28939.0675	0.76292	-4.611
		1,20,	12425	0.4795	1.3112	1.7601	0.7735	1.0383	0.2423	-2.0541	8.4248	6.2761	3010.5775	-25522.1925	0.35735	-4.06657
															7.2255	-45.5655

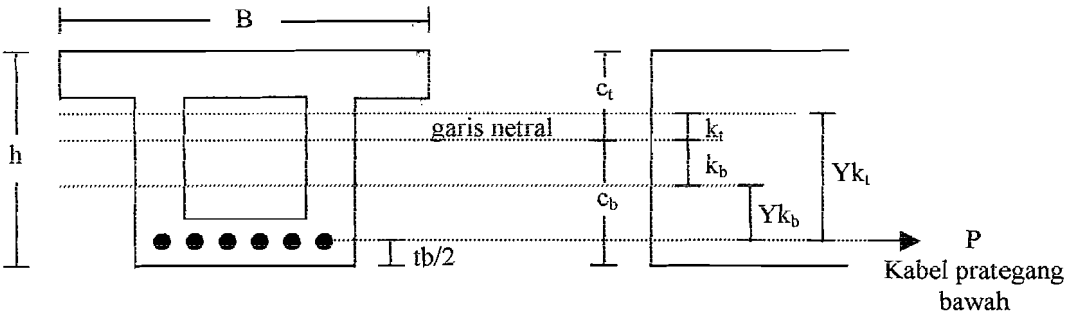
Lanjutan tabel 4.15 Tegangan saat transfer akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
54	60	,10,11,9,12	24850	0.2025	1.2842	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	12782.8400	-57309.0700	1.54042	-9.31643
		8,13,7,14	24850	0.2025	1.2842	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	12782.8400	-57309.0700	1.54042	-9.31643
		6,15,5,16	24850	0.2025	1.2842	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	12782.8400	-57309.0700	1.54042	-9.31643
		4,17,3,18	24850	0.2025	1.2842	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	12782.8400	-57309.0700	1.54042	-9.31643
		2,19	12425	0.2025	1.2842	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	6391.4200	-28654.5350	0.77021	-4.65821
		1,20,	12425	0.4475	1.2842	1.7459	0.7628	1.0290	0.2694	-2.0612	8.2983	6.1514	3347.2950	-25610.4100	0.40337	-4.16335
															7.3362	-46.0873
55	59	,10,11,9,12	24850	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	12733.1400	-56904.0150	1.55133	-9.38561
		8,13,7,14	24850	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	12733.1400	-56904.0150	1.55133	-9.38561
		6,15,5,16	24850	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	12733.1400	-56904.0150	1.55133	-9.38561
		4,17,3,18	24850	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	12733.1400	-56904.0150	1.55133	-9.38561
		2,19	12425	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	6366.5700	-28452.0075	0.77566	-4.69281
		1,20,	12425	0.4790	1.2821	1.7357	0.7552	1.0223	0.2344	-2.0119	8.2079	6.0629	2912.4200	-24997.8575	0.35483	-4.12309
															7.4001	-46.3583
56	58	,10,11,9,12	24850	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	12693.3800	-56650.5450	1.49087	-9.42542
		8,13,7,14	24850	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	12693.3800	-56650.5450	1.49087	-9.42542
		6,15,5,16	24850	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	12693.3800	-56650.5450	1.49087	-9.42542
		4,17,3,18	24850	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	12693.3800	-56650.5450	1.49087	-9.42542
		2,19	12425	0.2005	1.2749	1.7295	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	6346.6900	-28325.2725	0.74543	-4.71271
		1,20,	12425	0.4755	1.2749	1.7295	0.7506	1.0183	0.2358	-2.0047	8.5141	6.0104	2929.8150	-24908.3975	0.34411	-4.14422
															7.4652	-46.5586
57		,10,11,9,12	24850	0.2000	1.2725	1.7275	0.7491	1.0170	0.5105	-2.2766	8.1356	5.9928	12685.9250	-56573.5100	1.55931	-9.44025
		8,13,7,14	24850	0.2000	1.2725	1.7275	0.7491	1.0170	0.5105	-2.2766	8.1356	5.9928	12685.9250	-56573.5100	1.55931	-9.44025
		6,15,5,16	24850	0.2000	1.2725	1.7275	0.7491	1.0170	0.5105	-2.2766	8.1356	5.9928	12685.9250	-56573.5100	1.55931	-9.44025

Lanjutan tabel 4.15 Tegangan saat transfer akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
		4,17,3,18	24850	0.2000	1.2725	1.7275	0.7491	1.0170	0.5105	-2.2766	8.1356	5.9928	12685.9250	-56573.5100	1.55931	-9.44025
		2,19	12425	0.2000	1.2725	1.7275	0.7491	1.0170	0.5105	-2.2766	8.1356	5.9928	6342.9625	-28286.7550	0.77966	-4.72012
		1,20,	12425	0.4750	1.2725	1.7275	0.7491	1.0170	0.2355	-2.0016	8.1356	5.9928	2926.0875	-24869.8800	0.35966	-4.14996
															7.4713	-46.6311

4.14.4 Saat layan akibat kabel bawah



Mengacu pada formula (3.45) dan (3.46), maka diperoleh ;

Tegangan pada serat atas dan bawah No nodal 2 adalah

$Yk_b = c_b - k_b - tb/2 = 1{,}7296 - 1{,}0183 - 0{,}2003 = 0{,}5108$ m

$Yk_t = Yk_b + k_b + k_t = 0{,}5108 + 1{,}0183 + 0{,}7506 = -2{,}2797$ m

$Mk_b = P . Yk_b = 9940 . 0{,}511 = 5077{,}3520$ kNm

$Mk_t = P . Yk_t = 9940 . -2{,}28 = -22660{,}2180$ kNm

$$f\,atas = \frac{Mk_b(layan)}{Z_t} = \frac{5077{,}3520.10^6}{8{,}5141.10^9}$$

$$= 0{,}5963 \text{ Mpa}$$

$$f\,bawah = \frac{Mk_t(layan)}{Z_b} = \frac{22660{,}2180.10^6}{6{,}0104.10^9}$$

$$= -3{,}7702 \text{ Mpa}$$

Untuk tegangan akibat kabel bawah selanjutnya dapat dilihat pada tabel 4.16

Tabel 4.16 Tegangan saat layan akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
1	113				1.2725	1.7275	0.7491	1.0170			8.1356	5.9928				
2	112	1.2	9940	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	5077.3520	-22660.2160	0.5963	-3.7702
3	111	1.2	9940	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	5093.2560	-22761.6060	0.6205	-3.7542
4	110	1.2.3.4	19880	0.2025	1.2942	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	10226.2720	-45847.2560	1.2323	-7.4531
5	109	1.2.3.4	19880	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	10283.9240	-46302.5080	1.2207	-7.3776
6	108	1.2.3.4	19880	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5862	6.4377	10351.5160	-46877.0400	1.2053	-7.2816
7	107	1.2.3.4	19880	0.2105	1.3598	1.8005	0.8040	1.0645	0.5255	-2.3940	8.7892	6.6379	10446.9400	-47592.7200	1.1886	-7.1698
8	106	1.2.3.4	19880	0.2145	1.3915	1.8267	0.8238	1.0814	0.5308	-2.4360	9.0288	6.8778	10552.3040	-48427.6800	1.1687	-7.0412
9	105	1.2.3.4	19880	0.2190	1.4285	1.8566	0.8468	1.1006	0.5370	-2.4844	9.3066	7.1607	10675.5600	-49389.8720	1.1471	-6.8974
10	104	1.2.3.4	19880	0.2240	1.4705	1.8903	0.8728	1.1220	0.5443	-2.5391	9.6238	7.4865	10820.6840	-50477.3060	1.1244	-6.7424
11	103	1.2	9940	0.2295	1.5177	1.9278	0.9020	1.1457	0.5526	-2.6003	9.9821	7.8586	5492.8440	-25846.9820	0.5503	-3.2890
12	102	1.2	9940	0.2360	1.5702	1.9688	0.9342	1.1713	0.5615	-2.6670	10.3810	8.2793	5581.3100	-26509.9800	0.5376	-3.2020
13	101				1.6281	2.0134	0.9696	1.1991			10.8232	8.7520				
14	100				1.6915	2.0515	1.0081	1.2286			11.3092	9.2794				

Lanjutan tabel 4.16 Tegangan saat layan akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
15	99				1.7604	2.1130	1.0497	1.2600			11.8404	9.8646				
16	98				1.8349	2.1578	1.0944	1.2930			12.4183	10.5113				
17	97				1.9150	2.2259	1.1422	1.3277			13.0447	11.2227				
18	96				2.0009	2.2872	1.1931	1.3638			13.7214	12.0038				
19	95				2.0926	2.3517	1.2470	1.4014			14.4501	12.8580				
20	94				2.1902	2.4192	1.3040	1.4404			15.2320	13.7901				
21	93				2.2937	2.4898	1.3640	1.4807			16.0705	14.8048				
22	92				2.4032	2.5634	1.4271	1.5222			16.9672	15.9068				
23	91				2.5186	2.6400	1.4930	1.5649			17.9244	17.1012				
24	90				2.6402	2.7195	1.5619	1.6088			18.9444	18.3920				
25	89				2.7678	2.8019	1.6337	1.6538			20.0298	19.7860				
26	88				2.9017	2.8871	1.7084	1.6998			21.1831	21.2903				
27	87				3.0516	2.9752	1.7859	1.7469			22.4073	22.9074				
28	86				3.1877	3.0662	1.8662	1.7950			23.7056	24.6449				

Lanjutan tabel 4.16 Tegangan saat layan akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
29	85				3.3401	3.1599	1.9493	1.8441			25.0803	26.5105				
30	84				3.1877	3.0662	1.8662	1.7950			23.7056	24.6449				
31	83				3.0516	2.9752	1.7859	1.7469			22.4073	22.9074				
32	82				2.9017	2.8871	1.7084	1.6998			21.1831	21.2903				
33	81				2.7678	2.8019	1.6337	1.6538			20.0298	19.7860				
34	80				2.6402	2.7195	1.5619	1.6088			18.9444	18.3920				
35	79				2.5186	2.6400	1.4930	1.5649			17.9244	17.1012				
36	78				2.4032	2.5634	1.4271	1.5222			16.9672	15.9068				
37	77				2.2937	2.4898	1.3640	1.4807			16.0705	14.8048				
38	76				2.1902	2.4192	1.3040	1.4404			15.2320	13.7901				
39	75				2.0926	2.3517	1.2470	1.4014			14.4501	12.8580				
40	74				2.0009	2.2872	1.1931	1.3638			13.7214	12.0038				
41	73				1.9150	2.2259	1.1422	1.3277			13.0447	11.2227				
42	72	,10,11	9940	0.2670	1.8349	2.1678	1.0944	1.2930	0.6078	-2.9952	12.4183	10.5113	6041.5320	-29772.2880	0.4865	-2.8324

Lanjutan tabel 4.16 Tegangan saat layan akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
43	71	,10,11	9940	0.2580	1.7604	2.1130	1.0497	1.2600	0.5950	-2.9047	11.8404	9.8646	5914.3000	-28872.7180	0.4995	-2.9269
44	70	,10,11,9,12	19880	0.2500	1.6915	2.0615	1.0081	1.2286	0.5829	-2.8196	11.3092	9.2794	11588.0520	-56053.6480	1.0247	-6.0407
45	69	,10,11,9,12	19880	0.2430	1.6281	2.0134	0.9695	1.1991	0.5713	-2.7400	10.8232	8.7520	11357.4440	-54471.2000	1.0494	-6.2239
		8,13	9940	0.2430	1.6281	2.0134	0.9695	1.1991	0.5713	-2.7400	10.8232	8.7520	5678.7220	-27235.6000	0.5247	-3.1119
															1.5740	-9.3358
46	68	,10,11,9,12	19880	0.2360	1.5702	1.9688	0.9342	1.1713	0.5615	-2.6670	10.3810	8.2793	11162.6200	-53019.9600	1.0753	-6.4039
		8,13,7,14	19880	0.2360	1.5702	1.9688	0.9342	1.1713	0.5615	-2.6670	10.3810	8.2793	11162.6200	-53019.9600	1.0753	-6.4039
															2.1506	-12.8078
47	67	,10,11,9,12	19880	0.2295	1.5177	1.9278	0.9020	1.1457	0.5526	-2.6003	9.9821	7.8586	10985.6880	-51693.9640	1.1005	-6.5780
		8,13,7,14	19880	0.2295	1.5177	1.9278	0.9020	1.1457	0.5526	-2.6003	9.9821	7.8586	10985.6880	-51693.9640	1.1005	-6.5780
		6,15	9940	0.2295	1.5177	1.9278	0.9020	1.1457	0.5526	-2.6003	9.9821	7.8586	5492.8440	-25846.9820	0.5503	-3.2890
															2.7513	-16.4450
48	66	,10,11,9,12	19880	0.2240	1.4705	1.8903	0.8728	1.1220	0.5443	-2.5391	9.6238	7.4865	10820.6840	-50477.3080	1.2381	-6.7424
		8,13,7,14	19880	0.2240	1.4705	1.8903	0.8728	1.1220	0.5443	-2.5391	9.6238	7.4865	10820.6840	-50477.3080	1.2381	-6.7424
		6,15,5,16	19880	0.2240	1.4705	1.8903	0.8728	1.1220	0.5443	-2.5391	9.6238	7.4865	10820.6840	-50477.3080	1.2381	-6.7424
															3.7143	-20.2273
49	65	,10,11,9,12	19880	0.2190	1.4285	1.8566	0.8468	1.1006	0.5370	-2.4844	9.3066	7.1607	10675.5600	-49389.8720	1.2768	-6.8974
		8,13,7,14	19880	0.2190	1.4285	1.8566	0.8468	1.1006	0.5370	-2.4844	9.3066	7.1607	10675.5600	-49389.8720	1.2768	-6.8974
		6,15,5,16	19880	0.2190	1.4285	1.8566	0.8468	1.1006	0.5370	-2.4844	9.3066	7.1607	10675.5600	-49389.8720	1.2768	-6.8974
		4,17	9940	0.2190	1.4285	1.8566	0.8468	1.1006	0.5370	-2.4844	9.3066	7.1607	5337.7800	-24694.9360	0.6034	-3.4487
															4.4338	-24.1407

Lanjutan tabel 4.16 Tegangan saat layan akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
50	64	,10,11,9,12	19880	0.2145	1.3915	1.8267	0.8238	1.0814	0.5308	-2.4360	9.0288	6.8778	10552.3040	-48427.6800	1.2978	-7.0412
		8,13,7,14	19880	0.2145	1.3915	1.8267	0.8238	1.0814	0.5308	-2.4360	9.0288	6.8778	10552.3040	-48427.6800	1.2978	-7.0412
		6,15,5,16	19880	0.2145	1.3915	1.8267	0.8238	1.0814	0.5308	-2.4360	9.0288	6.8778	10552.3040	-48427.6800	1.2978	-7.0412
		4,17,3,18	19880	0.2145	1.3915	1.8267	0.8238	1.0814	0.5308	-2.4360	9.0288	6.8778	10552.3040	-48427.6800	1.2978	-7.0412
															5.1912	-28.1646
51	63	,10,11,9,12	19880	0.2105	1.3598	1.8005	0.8040	1.0645	0.5255	-2.3940	8.7892	6.6379	10446.9400	-47592.7200	1.3890	-7.1698
		8,13,7,14	19880	0.2105	1.3598	1.8005	0.8040	1.0645	0.5255	-2.3940	8.7892	6.6379	10446.9400	-47592.7200	1.3890	-7.1698
		6,15,5,16	19880	0.2105	1.3598	1.8005	0.8040	1.0645	0.5255	-2.3940	8.7892	6.6379	10446.9400	-47592.7200	1.3890	-7.1698
		4,17,3,18	19880	0.2105	1.3598	1.8005	0.8040	1.0645	0.5255	-2.3940	8.7892	6.6379	10446.9400	-47592.7200	1.3890	-7.1698
															5.5560	-28.6794
52	62	,10,11,9,12	19880	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	10351.5160	-46877.0400	1.4082	-7.2816
		8,13,7,14	19880	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	10351.5160	-46877.0400	1.4082	-7.2816
		6,15,5,16	19880	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	10351.5160	-46877.0400	1.4082	-7.2816
		4,17,3,18	19880	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	10351.5160	-46877.0400	1.4082	-7.2816
		2.19	9940	0.2075	1.3330	1.7783	0.7872	1.0501	0.5207	-2.3580	8.5882	6.4377	5175.7580	-23438.5200	0.6134	-3.6408
															6.2462	-32.7674
53	61	,10,11,9,12	19880	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	10283.9240	-46302.5080	1.4635	-7.3776
		8,13,7,14	19880	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	10283.9240	-46302.5080	1.4635	-7.3776
		6,15,5,16	19880	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	10283.9240	-46302.5080	1.4635	-7.3776
		4,17,3,18	19880	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	10283.9240	-46302.5080	1.4635	-7.3776
		2.19	9940	0.2045	1.3112	1.7601	0.7735	1.0383	0.5173	-2.3291	8.4248	6.2761	5141.9620	-23151.2540	0.6253	-3.6888
		1,20,	9940	0.4795	1.3112	1.7601	0.7735	1.0383	0.2423	-2.0541	8.4248	6.2761	2408.4620	-20417.7540	0.2859	-3.2533
															6.7654	-36.4524

Lanjutan tabel 4.16 Tegangan saat layan akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt ' (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
54	60	,10,11,9,12	19880	0.2025	1.2942	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	10226.2720	-45847.2560	1.5195	-7.4531
		8,13,7,14	19880	0.2025	1.2942	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	10226.2720	-45847.2560	1.5195	-7.4531
		6,15,5,16	19880	0.2025	1.2942	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	10226.2720	-45847.2560	1.5195	-7.4531
		4,17,3,18	19880	0.2025	1.2942	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	10226.2720	-45847.2560	1.5195	-7.4531
		2.19	9940	0.2025	1.2942	1.7459	0.7628	1.0290	0.5144	-2.3062	8.2983	6.1514	5113.1360	-22923.6280	0.6302	-3.7266
		1,20,	9940	0.4475	1.2942	1.7459	0.7628	1.0290	0.2694	-2.0612	8.2983	6.1514	2677.8360	-20488.3280	0.3227	-3.3307
															7.0310	-36.8698
55	59	,10,11,9,12	19880	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	10186.5120	-45523.2120	1.5376	-7.5085
		8,13,7,14	19880	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	10186.5120	-45523.2120	1.5376	-7.5085
		6,15,5,16	19880	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	10186.5120	-45523.2120	1.5376	-7.5085
		4,17,3,18	19880	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	10186.5120	-45523.2120	1.5376	-7.5085
		2.19	9940	0.2010	1.2821	1.7357	0.7552	1.0223	0.5124	-2.2899	8.2079	6.0629	5093.2560	-22761.6060	0.6389	-3.7542
		1,20,	9940	0.4790	1.2821	1.7357	0.7552	1.0223	0.2344	-2.0119	8.2079	6.0629	2329.9360	-19998.2860	0.3165	-3.2985
															7.1058	-37.0867
56	58	,10,11,9,12	19880	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	10154.7040	-45320.4360	1.5655	-7.5403
		8,13,7,14	19880	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	10154.7040	-45320.4360	1.5655	-7.5403
		6,15,5,16	19880	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	10154.7040	-45320.4360	1.5655	-7.5403
		4,17,3,18	19880	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	10154.7040	-45320.4360	1.5655	-7.5403
		2.19	9940	0.2005	1.2749	1.7296	0.7506	1.0183	0.5108	-2.2797	8.5141	6.0104	5077.3520	-22660.2180	0.6405	-3.7702
		1,20,	9940	0.4755	1.2749	1.7296	0.7506	1.0183	0.2358	-2.0047	8.5141	6.0104	2343.8520	-19926.7180	0.2983	-3.3154
															7.2008	-37.2469
57		10,11,9,12	19880	0.2000	1.2725	1.7275	0.7491	1.0170	0.5105	-2.2766	8.1356	5.9928	10148.7400	-45258.8080	1.5966	-7.5522
		8,13,7,14	19880	0.2000	1.2725	1.7275	0.7491	1.0170	0.5105	-2.2766	8.1356	5.9928	10148.7400	-45258.8080	1.5966	-7.5522
		6,15,5,16	19880	0.2000	1.2725	1.7275	0.7491	1.0170	0.5105	-2.2766	8.1356	5.9928	10148.7400	-45258.8080	1.5966	-7.5522

Lanjutan tabel 4.16 Tegangan saat layan akibat kabel bawah tiap segmen tumpuan A - D

No nodal		No kabel	P (kN)	Y1 (m)	ct (m)	cb (m)	kt (m)	kb (m)	Ykb (m)	Ykt (m)	Zt (m^3)	Zb (m^3)	Mkb (kNm)	Mkt (kNm)	f atas (Mpa)	f bawah (Mpa)
		4,17,3,18	19880	0.2000	1.2725	1.7275	0.7491	1.0170	0.5105	-2.2766	8.1356	5.9928	10148.7400	-45258.8080	1.5966	-7.5522
		2,19	9940	0.2000	1.2725	1.7275	0.7491	1.0170	0.5105	-2.2766	8.1356	5.9928	5074.3700	-22629.4040	0.6485	-3.7761
		1,20,	9940	0.4750	1.2725	1.7275	0.7491	1.0170	0.2355	-2.0016	8.1356	5.9928	2340.8700	-19895.9040	0.2877	-3.3200
															7.3221	-37.3049

4.15 Perhitungan Tegangan Total Tiap Segmen Tumpuan A -D

4.15.1 Saat transfer pada saat pelaksanaan

Mengacu pada formula (3.47) dan (3.48), dimana kabel bawah dipasang bersamaan dengan kabel atas pada bentang A – B dan C – D, maka diperoleh ;

Tegangan pada serat atas dan bawah untuk No nodal 2 adalah

f atas = f atas (akibat momen saat pelaksanaan) + f atas (akibat kabel atas) + f atas (akibat kabel bawah)

= 0,1999 + (-1,1231) + 0,7454

= - 0,1778 Mpa

f bawah = f bawah (akibat momen saat pelaksanaan) + f bawah (akibat kabel atas) + f bawah (akibat kabel bawah)

= - 0,2712 + 0,2361 + (-4,7127)

= - 4,.7478 Mpa

Untuk tegangan selanjutnya dapat dilihat pada tabel 4.17

Tabel 4.17 Tegangan saat transfer yang terjadi saat pelaksanaan tiap segmen tumpuan A - D

Karena pemasangan pada Pedy A - D pakai perancah

No nodal	Jarak (m)	Tegangan momen		Tegangan Kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	2.5	0.1999	-0.2712	-1.1231	0.2361	0.7454	-4.7127	-0.1778	-4.7478
3	5.0	0.5533	-0.7491	-2.2434	0.4718	0.7757	-4.6928	-0.9144	-4.9701
4	7.5	1.0563	-1.4250	-3.3582	0.7071	1.5404	-9.3164	-0.7615	-10.0343
5	10.0	1.7013	-2.2838	-4.4649	0.9416	1.5258	-9.2220	-1.2378	-10.5642
6	12.5	2.4774	-3.3049	-5.5606	1.1750	1.5067	-9.1021	-1.5765	-11.2320
7	15.0	3.3706	-4.4630	-6.6431	1.4070	1.4858	-8.9623	-1.7867	-12.0183
8	17.5	4.3651	-5.7302	-7.7095	1.6373	1.4610	-8.8015	-1.8834	-12.8944
9	20.0	5.4442	-7.0757	-8.7592	1.8657	1.4339	-8.6217	-1.8811	-13.8317
10	22.5	6.5901	-8.4715	-9.7887	2.0917	1.4055	-8.4281	-1.7931	-14.8079
11	25.0	7.7848	-9.8883	-10.7967	2.3143	0.6878	-4.1113	-2.3241	-11.6853
12	27.5	9.0124	-11.3001	-12.6424	2.5005	0.6721	-4.0025	-2.9579	-12.8021
13	30.0	10.2557	-12.6828	-14.6656	2.9588	-	-	-4.4099	-9.7240
14	32.5	11.5011	-14.0168	-16.6430	3.4108	-	-	-5.1419	-10.6060
15	35.0	12.7354	-15.2861	-17.7162	3.8505	-	-	-4.9808	-11.4356
16	37.5	13.9474	-16.4778	-19.4225	4.0662	-	-	-5.4751	-12.4116
17	40.0	15.1275	-17.5834	-21.2623	4.4943	-	-	-6.1348	-13.0891
18	42.5	16.2675	-18.5952	-23.0487	4.5350	-	-	-6.7812	-14.0602
19	45.0	17.3615	-19.5112	-24.7814	5.3216	-	-	-7.4199	-14.1896
20	47.5	18.4053	-20.3297	-25.6191	5.6602	-	-	-7.2138	-14.6695
21	50.0	19.3937	-21.0517	-27.1103	5.8900	-	-	-7.7166	-15.1617
22	52.5	20.3251	-21.6800	-28.6890	6.2662	-	-	-8.3639	-15.4138
23	55.0	21.1978	-22.2195	-29.3838	6.5480	-	-	-8.1860	-15.6715
24	57.5	22.0115	-22.6726	-30.7419	6.7756	-	-	-8.7304	-15.8970
25	60.0	22.7661	-23.0466	-32.1643	7.1185	-	-	-9.3982	-15.9281
26	62.5	23.4623	-23.3442	-32.6226	7.2454	-	-	-9.1603	-16.0988

Lanjutan tabel 4.17 Tegangan saat transfer yang terjadi saat pelaksanaan tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan Kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
27	65.0	24.1011	-23.5750	-33.7513	7.3752	-	-	-9.6502	-16.1998
28	67.5	24.6836	-23.7429	-34.7533	7.4311	-	-	-10.0697	-16.3118
29	70.0	25.2124	-23.8522	-35.6444	7.4285	-	-	-10.4320	-16.4237
30	72.5	24.6836	-23.7429	-34.7533	7.4311	-	-	-10.0697	-16.3118
31	75.0	24.1011	-23.5750	-33.7513	7.3752	-	-	-9.6502	-16.1998
32	77.5	23.4623	-23.3442	-32.6226	7.2454	-	-	-9.1603	-16.0988
33	80.0	22.7661	-23.0466	-32.1643	7.1185	-	-	-9.3982	-15.9281
34	82.5	22.0115	-22.6726	-30.7419	6.7756	-	-	-8.7304	-15.8970
35	85.0	21.1978	-22.2195	-29.3838	6.5480	-	-	-8.1860	-15.6715
36	87.5	20.3251	-21.6300	-28.6890	6.2662	-	-	-8.3639	-15.4138
37	90.0	19.3937	-21.0517	-27.1103	5.8900	-	-	-7.7166	-15.1617
38	92.5	18.4053	-20.3297	-25.6191	5.6602	-	-	-7.2138	-14.6695
39	95.0	17.3615	-19.5112	-24.7814	5.3216	-	-	-7.4199	-14.1896
40	97.5	16.2675	-18.5952	-23.0487	4.5350	-	-	-6.7812	-14.0602
41	100.0	15.1275	-17.5334	-21.2623	4.4943	-	-	-6.1348	-13.0891
42	102.5	13.9474	-16.4778	-19.4225	4.0662	-	-	-5.4751	-12.4116
43	105.0	12.7354	-15.2361	-17.7162	3.8505	-	-	-4.9808	-11.4356
44	107.5	11.5011	-14.0168	-16.6430	3.4108	-	-	-5.1419	-10.6060
45	110.0	10.2557	-12.6328	-14.6656	2.9588	-	-	-4.4099	-9.7240
46	112.5	9.0124	-11.3001	-12.6424	2.5005	-	-	-3.6300	-8.7996
47	115.0	7.7848	-9.8383	-10.7967	2.3143	-	-	-3.0119	-7.5740
48	117.5	6.5901	-8.4715	-9.7887	2.0917	-	-	-3.1986	-6.3798
49	120.0	5.4442	-7.0757	-8.7592	1.8657	-	-	-3.3150	-5.2100
50	122.5	4.3651	-5.7302	-7.7095	1.6373	-	-	-3.3444	-4.0929
51	125.0	3.3706	-4.4630	-6.6431	1.4070	-	-	-3.2725	-3.0560
52	127.5	2.4774	-3.3049	-5.5606	1.1750	-	-	-3.0832	-2.1299

Lanjutan tabel 4.17 Tegangan saat transfer yang terjadi saat pelaksanaan tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan Kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
53	130.0	1.7013	-2.2838	-4.4649	0.9416	-	-	-2.7636	-1.3422
54	132.5	1.0563	-1.4250	-3.3582	0.7071	-	-	-2.3019	-0.7179
55	135.0	0.6064	-0.8210	-2.2434	0.4718	-	-	-1.6370	-0.3492
56	137.5	0.2204	-0.2990	-1.1231	0.2361	-	-	-0.9027	-0.0629
57	140.0	0.0000	0.0000	0.0000	0.0000	-	-	0.0000	0.0000
58	142.5	0.2181	-0.2958	-1.1231	0.2361	-	-	-0.9050	-0.0597
59	145.0	0.5999	-0.8121	-2.2434	0.4718	-	-	-1.6435	-0.3403
60	147.5	1.1378	-1.5349	-3.3582	0.7071	-	-	-2.2204	-0.8278
61	150.0	1.8201	-2.4432	-4.4649	0.9416	-	-	-2.6448	-1.5016
62	152.5	2.6315	-3.5106	-5.5606	1.1750	-	-	-2.9291	-2.3356
63	155.0	3.5543	-4.7062	-6.6431	1.4070	-	-	-3.0888	-3.2992
64	157.5	4.5692	-5.9982	-7.7095	1.6373	-	-	-3.1403	-4.3609
65	160.0	5.6566	-7.3518	-8.7592	1.8657	-	-	-3.1026	-5.4861
66	162.5	6.7969	-8.7374	-9.7887	2.0917	-	-	-2.9918	-6.6457
67	165.0	7.9711	-10.1249	-10.7967	2.3143	-	-	-2.8256	-7.8106
68	167.5	9.163	-11.4891	-12.6424	2.5005	-	-	-3.4794	-8.9886
69	170.0	10.3564	-12.8073	-14.6656	2.9588	-	-	-4.3092	-9.8485
70	172.5	11.5378	-14.0615	-16.6430	3.4108	-	-	-5.1052	-10.6507
71	175.0	12.6959	-15.2387	-17.7162	3.8505	-	-	-5.0203	-11.3882
72	177.5	13.8215	-16.3291	-19.4225	4.0662	-	-	-5.6010	-12.2629
73	180.0	14.9074	-17.3276	-21.2623	4.4943	-	-	-6.3549	-12.8333
74	182.5	15.9466	-18.2282	-23.0487	4.5350	-	-	-7.1021	-13.6932
75	185.0	16.9348	-19.0316	-24.7814	5.3216	-	-	-7.8466	-13.7100
76	187.5	17.8712	-19.7397	-25.6191	5.6602	-	-	-7.7479	-14.0795
77	190.0	18.7512	-20.3543	-27.1103	5.8900	-	-	-8.3591	-14.4643
78	192.5	19.574	-20.8789	-28.6890	6.2662	-	-	-9.1150	-14.6127

Lanjutan tabel 4.17 Tegangan saat transfer yang terjadi saat pelaksanaan tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan Kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
79	195.0	20.3411	-21.3215	-29.3838	6.5480	-	-	-9.0427	-14.7735
80	197.5	21.0508	-21.6830	-30.7419	6.7756	-	-	-9.6911	-14.9074
81	200.0	21.7065	-21.9740	-32.1643	7.1185	-	-	-10.4578	-14.8555
82	202.5	23.4623	-23.3442	-32.6226	7.2454	-	-	-9.1603	-16.0988
83	205.0	24.1011	-23.5750	-33.7513	7.3752	-	-	-9.6502	-16.1998
84	207.5	24.6836	-23.7429	-34.7533	7.4311	-	-	-10.0697	-16.3118
85	210.0	25.2124	-23.8522	-35.6444	7.4285	-	-	-10.4320	-16.4237
86	212.5	24.6836	-23.7429	-34.7533	7.4311	-	-	-10.0697	-16.3118
87	215.0	24.1011	-23.5750	-33.7513	7.3752	-	-	-9.6502	-16.1998
88	217.5	23.4623	-23.3442	-32.6226	7.2454	-	-	-9.1603	-16.0988
89	220.0	22.7661	-23.0466	-32.1643	7.1185	-	-	-9.3982	-15.9281
90	222.5	22.0115	-22.6726	-30.7419	6.7756	-	-	-8.7304	-15.8970
91	225.0	21.1978	-22.2195	-29.3838	6.5480	-	-	-8 1860	-15.6715
92	227.5	20.3251	-21.6800	-28.6890	6.2662	-	-	-8 3639	-15.4138
93	230.0	19.3937	-21.0517	-27.1103	5.8900	-	-	-7 7166	-15.1617
94	232.5	18.4053	-20.3297	-25.6191	5.6602	-	-	-7.2138	-14.6695
95	235.0	17.3615	-19.5112	-24.7814	5.3216	-	-	-7.4199	-14.1896
96	237.5	16.2675	-18.5952	-23.0487	4.5350	-	-	-6.7812	-14.0602
97	240.0	15.1275	-17.5834	-21.2623	4.4943	-	-	-6.1348	-13.0891
98	242.5	13.9474	-16.4778	-19.4225	4.0662	-	-	-5.4751	-12.4116
99	245.0	12.7354	-15.2861	-17.7162	3.8505	-	-	-4.9808	-11.4356
100	247.5	11.5011	-14.0168	-16.6430	3.4108	-	-	-5.1419	-10.6060
101	250.0	10.2557	-12.6828	-14.6656	2.9588	-	-	-4.4099	-9.7240
102	252.5	9.0124	-11.3001	-12.6424	2.5005	0.672[illegible]	-4.0025	-2.9579	-12.8021
103	255.0	7.7848	-9.8883	-10.7967	2.3143	0.6878	-4.1113	-2.3241	-11.6853
104	257.5	6.5901	-8.4715	-9.7887	2.0917	1.4055	-8.4281	-1.7931	-14.8079

Lanjutan tabel 4.17 Tegangan saat transfer yang terjadi saat pelaksanaan tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan Kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
105	260.0	5.4442	-7.0757	-8.7592	1.8657	1.4339	-8.6217	-1.8811	-13.8317
106	262.5	4.3651	-5.7302	-7.7095	1.6373	1.4610	-8.8015	-1 8834	-12.8944
107	265.0	3.3706	-4.4630	-6.6431	1.4070	1.4858	-8.9623	-1 7867	-12.0183
108	267.5	2.4774	-3.3049	-5.5606	1.1750	1.5067	-9.1021	-1 5765	-11.2320
109	270.0	1.7013	-2.2838	-4.4649	0.9416	1.5258	-9.2220	-1.2378	-10.5642
110	272.5	1.0563	-1.4250	-3.3582	0.7071	1.5404	-9.3164	-0.7615	-10.0343
111	275.0	0.5533	-0.7491	-2.2434	0.4718	0.7757	-4.6928	-0.9144	-4.9701
112	277.5	0.1999	-0.2712	-1.1231	0.2361	0.7454	-4.7127	-0.1778	-4.7478
113	280.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.15.2 Saat layan pada saat pelaksanaan

Mengacu pada formula (3.47) dan (3.48), dimana kabel bawah dipasang bersamaan dengan kabel atas pada bentang A – B dan C – D, maka diperoleh ;

Tegangan pada serat atas dan bawah No nodal 2 adalah

f atas = f atas (akibat momen saat pelaksanaan) + f atas (akibat kabel atas) + f atas (akibat kabel bawah)

= 0,1999 + (-0,8985) + 0,5963

= - 0,1023 Mpa

f bawah = f bawah (akibat momen saat pelaksanaan) + f bawah (akibat kabel atas) + f bawah (akibat kabel bawah)

= - 0,2712 + 0,1888 + (-3,7702)

= - 3,.8526 Mpa

Untuk tegangan selanjutnya dapat dilihat pada tabel 4.18

Tabel 4.18 Tegangan saat layan yang terjadi saat pelaksanaan tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	2.5	0.1999	-0.2712	-0.8985	0.1888	0.5963	-3.7702	-0.1023	-3.8526
3	5.0	0.5533	-0.7491	-1.7947	0.3774	0.6205	-3.7542	-0.6209	-4.1259
4	7.5	1.0563	-1.4250	-2.6865	0.5657	1.2323	-7.4531	-0.3979	-8.3124
5	10.0	1.7013	-2.2838	-5.7200	0.7533	1.2207	-7.3776	-2.7980	-8.9081
6	12.5	2.4774	-3.3049	-4.4485	0.9400	1.2053	-7.2816	-0.7658	-9.6465
7	15.0	3.3706	-4.4630	-5.3145	1.1256	1.1886	-7.1698	-0.7553	-10.5072
8	17.5	4.3651	-5.7302	-6.1676	1.3098	1.1687	-7.0412	-0.6338	-11.4616
9	20.0	5.4442	-7.0757	-7.0074	1.4925	1.1471	-6.8974	-0.4161	-12.4806
10	22.5	6.5901	-8.4715	-7.8310	1.6734	1.1244	-6.7424	-0.1165	-13.5405
11	25.0	7.7848	-9.8883	-8.6374	1.8514	0.5503	-3.2890	-0.3023	-11.3259
12	27.5	9.0124	-11.3001	-10.1140	2.0004	0.5376	-3.2020	-0.5640	-12.5017
13	30.0	10.2557	-12.6828	-11.7325	2.3671	-	-	-1.4768	-10.3157
14	32.5	11.5011	-14.0168	-13.3144	2.7287	-	-	-1.8133	-11.2881
15	35.0	12.7354	-15.2861	-14.1730	3.0804	-	-	-1.4376	-12.2057
16	37.5	13.9474	-16.4778	-15.5380	3.2530	-	-	-1.5906	-13.2248
17	40.0	15.1275	-17.5834	-17.0099	3.5955	-	-	-1.8824	-13.9879
18	42.5	16.2675	-18.5952	-18.4390	3.6280	-	-	-2.1715	-14.1672
19	45.0	17.3615	-19.5112	-19.8251	4.2573	-	-	-2.4636	-14.4539
20	47.5	18.4053	-20.3297	-21.4953	4.5282	-	-	-3.0900	-14.6015
21	50.0	19.3937	-21.0517	-21.6883	4.7120	-	-	-2.2946	-15.1397
22	52.5	20.3251	-21.6800	-22.9512	5.0130	-	-	-2.6261	-15.4670
23	55.0	21.1978	-22.2195	-23.5070	5.2384	-	-	-2.3092	-15.6811
24	57.5	22.0115	-22.6726	-24.5935	5.4205	-	-	-2.5820	-15.8521
25	60.0	22.7661	-23.0466	-25.7315	5.6948	-	-	-2.9654	-15.9518
26	62.5	23.4623	-23.3442	-26.0981	5.7963	-	-	-2.6358	-16.0479

Lanjutan tabel 4.18 Tegangan saat layan yang terjadi saat pelaksanaan tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
27	65.0	24.1011	-23.5750	-27.0010	5.9002	-	-	-2.8999	-16.0948
28	67.5	24.6836	-23.7429	-27.8026	5.9448	-	-	-3.1190	-16.1481
29	70.0	25.2124	-23.8522	-28.5155	5.9428	-	-	-3.3031	-16.1844
30	72.5	24.6836	-23.7429	-27.8026	5.9448	-	-	-3.1190	-16.1481
31	75.0	24.1011	-23.5750	-27.0010	5.9002	-	-	-2.8999	-16.0948
32	77.5	23.4623	-23.3442	-26.0981	5.7963	-	-	-2.6358	-16.0479
33	80.0	22.7661	-23.0466	-25.7315	5.6948	-	-	-2.9654	-15.9518
34	82.5	22.0115	-22.6726	-24.5935	5.4205	-	-	-2.5820	-15.8521
35	85.0	21.1978	-22.2195	-23.5070	5.2384	-	-	-2.3092	-15.6811
36	87.5	20.3251	-21.6800	-22.9512	5.0130	-	-	-2.6261	-15.4670
37	90.0	19.3937	-21 0517	-21.6883	4.7120	-	-	-2.2946	-15.1397
38	92.5	18.4053	-20.3297	-21.4953	4.5282	-	-	-3.0900	-14.6015
39	95.0	17.3615	-19.5112	-19.8251	4.2573	-	-	-2.4636	-14.4539
40	97.5	16.2675	-18.5952	-18.4390	3.6280	-	-	-2.1715	-14.1672
41	100.0	15.1275	-17.5834	-17.0099	3.5955	-	-	-1.8824	-13.9879
42	102.5	13.9474	-16.4778	-15.5380	3.2530	-	-	-1.5906	-13.2248
43	105.0	12.7354	-15.2861	-14.1730	3.0804	-	-	-1.4376	-12.2057
44	107.5	11.5011	-14.0168	-13.3144	2.7287	-	-	-1.8133	-11.2881
45	110.0	10.2557	-12.6828	-11.7325	2.3671	-	-	-1.4768	-10.3157
46	112.5	9.0124	-11.3001	-10.1140	2.0004	-	-	-1.1016	-12.5017
47	115.0	7.7848	-9.8883	-8.6374	1.8514	-	-	-0.8526	-11.3259
48	117.5	6.5901	-8.4715	-7.8310	1.6734	-	-	-1.2409	-13.5405
49	120.0	5.4442	-7.0757	-7.0074	1.4925	-	-	-1.5632	-12.4806
50	122.5	4.3651	-5.7302	-6.1676	1.3098	-	-	-1.8025	-11.4616
51	125.0	3.3706	-4.4630	-5.3145	1.1256	-	-	-1.9439	-10.5072
52	127.5	2.4774	-3.3049	-4.4485	0.9400	-	-	-1.9711	-9.6465

Lanjutan tabel 4.18 Tegangan saat layan yang terjadi saat pelaksanaan tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
53	130.0	1.7013	-2.2838	-5.7200	0.7533	-	-	-4.0187	-8.9081
54	132.5	1.0563	-1.4250	-2.6865	0.5657	-	-	-1.6302	-8.3124
55	135.0	0.6064	-0.8210	-1.7947	0.3774	-	-	-1.1883	-4.1259
56	137.5	0.2204	-0.2990	-0.8985	0.1888	-	-	-0.6781	-3.8526
57	140.0	0.0000	0.0000	0.0000	0.0000	-	-	0.0000	0.0000
58	142.5	0.2181	-0.2958	-0.8985	0.1888	-	-	-0.6804	-3.8526
59	145.0	0.5999	-0.8121	-1.7947	0.3774	-	-	-1.1948	-4.1259
60	147.5	1.1378	-1.5349	-2.6865	0.5657	-	-	-1.5487	-8.3124
61	150.0	1.8201	-2.4432	-5.7200	0.7533	-	-	-3.8999	-8.9081
62	152.5	2.6315	-3.5106	-4.4485	0.9400	-	-	-1.8170	-9.6465
63	155.0	3.5543	-4.7062	-5.3145	1.1256	-	-	-1.7602	-10.5072
64	157.5	4.5692	-5.9982	-6.1676	1.3098	-	-	-1.5984	-11.4616
65	160.0	5.6566	-7.3518	-7.0074	1.4925	-	-	-1.3508	-12.4806
66	162.5	6.7969	-8.7374	-7.8310	1.6734	-	-	-1.0341	-13.5405
67	165.0	7.9711	-10.1249	-8.6374	1.8514	-	-	-0.6663	-11.3259
68	167.5	9.163	-11.4891	-10.1140	2.0004	-	-	-0.9510	-12.5017
69	170.0	10.3564	-12.8073	-11.7325	2.3671	-	-	-1.3761	-10.3157
70	172.5	11.5378	-14.0815	-13.3144	2.7287	-	-	-1.7766	-11.2881
71	175.0	12.6959	-15.2387	-14.1730	3.0804	-	-	-1.4771	-12.2057
72	177.5	13.8215	-16.3291	-15.5380	3.2530	-	-	-1.7165	-13.2248
73	180.0	14.9074	-17.3276	-17.0099	3.5955	-	-	-2.1025	-13.9879
74	182.5	15.9466	-18.2282	-18.4390	3.6280	-	-	-2.4924	-14.1672
75	185.0	16.9348	-19.0316	-19.8251	4.2573	-	-	-2.8903	-14.4539
76	187.5	17.8712	-19.7397	-21.4953	4.5282	-	-	-3.6241	-14.6015
77	190.0	18.7512	-20.3543	-21.6883	4.7120	-	-	-2.9371	-15.1397
78	192.5	19.574	-20.8789	-22.9512	5.0130	-	-	-3.3772	-15.4670

Lanjutan tabel 4.18 Tegangan saat layan yang terjadi saat pelaksanaan tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
79	195.0	20.3411	-21.3215	-23.5070	5.2384	-	-	-3.1659	-15.6811
80	197.5	21.0508	-21.6830	-24.5935	5.4205	-	-	-3.5427	-15.8521
81	200.0	21.7065	-21.9740	-25.7315	5.6948	-	-	-4.0250	-15.9518
82	202.5	23.4623	-23.3442	-26.0981	5.7963	-	-	-2.6358	-16.0479
83	205.0	24.1011	-23.5750	-27.0010	5.9002	-	-	-2.8999	-16.0948
84	207.5	24.6336	-23.7429	-27.8026	5.9448	-	-	-3.1190	-16.1481
85	210.0	25.2124	-23.8522	-28.5155	5.9428	-	-	-3.3031	-16.1844
86	212.5	24.6336	-23.7429	-27.8026	5.9448	-	-	-3.1190	-16.1481
87	215.0	24.1011	-23.5750	-27.0010	5.9002	-	-	-2.8999	-16.0948
88	217.5	23.4623	-23.3442	-26.0981	5.7963	-	-	-2.6358	-16.0479
89	220.0	22.7661	-23.0466	-25.7315	5.6948	-	-	-2.9654	-15.9518
90	222.5	22.0115	-22.6726	-24.5935	5.4205	-	-	-2.5820	-15.8521
91	225.0	21.1978	-22.2195	-23.5070	5.2384	-	-	-2.3092	-15.6811
92	227.5	20.3251	-21.6800	-22.9512	5.0130	-	-	-2.6261	-15.4670
93	230.0	19.3937	-21.0517	-21.6883	4.7120	-	-	-2.2946	-15.1397
94	232.5	18.4053	-20.3297	-21.4953	4.5282	-	-	-3.0900	-14.6015
95	235.0	17.3615	-19.5112	-19.8251	4.2573	-	-	-2.4636	-14.4539
96	237.5	16.2675	-18.5952	-18.4390	3.6280	-	-	-2.1715	-14.1672
97	240.0	15.1275	-17.5834	-17.0099	3.5955	-	-	-1.8824	-13.9879
98	242.5	13.9474	-16.4778	-15.5380	3.2530	-	-	-1.5906	-13.2248
99	245.0	12.7354	-15.2861	-14.1730	3.0804	-	-	-1.4376	-12.2057
100	247.5	11.5011	-14.0168	-13.3144	2.7287	-	-	-1.8133	-11.2881
101	250.0	10.2557	-12.6828	-11.7325	2.3671	-	-	-1.4768	-10.3157
102	252.5	9.0124	-11.3001	-10.1140	2.0004	0.5376	-3.2020	-0.5640	-12.5017
103	255.0	7.7848	-9.8883	-8.6374	1.8514	0.5503	-3.2890	-0.3023	-11.3259
104	257.5	6.5901	-8.4715	-7.8310	1.6734	1.1244	-6.7424	-0.1165	-13.5405

Lanjutan tabel 4.18 Tegangan saat layan yang terjadi saat pelaksanaan tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
105	260.0	5.4442	-7.0757	-7.0074	1.4925	1.1471	-6.8974	-0.4161	-12.4806
106	262.5	4.3651	-5.7302	-6.1676	1.3098	1.1687	-7.0412	-0.6338	-11.4616
107	265.0	3.3706	-4.4630	-5.3145	1.1256	1.1886	-7.1698	-0.7553	-10.5072
108	267.5	2.4774	-3.3049	-4.4485	0.9400	1.2053	-7.2816	-0.7658	-9.6465
109	270.0	1.7013	-2.2838	-5.7200	0.7533	1.2207	-7.3776	-2.7980	-8.9081
110	272.5	1.0563	-1.4250	-2.6865	0.5657	1.2323	-7.4531	-0.3979	-8.3124
111	275.0	0.5533	-0.7491	-1.7947	0.3774	0.6205	-3.7542	-0.6209	-4.1259
112	277.5	0.1999	-0.2712	-0.8985	0.1888	0.5963	-3.7702	-0.1023	-3.8526
113	280.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.15.3 Saat transfer pada saat servise

Mengacu pada formula (3.47) dan (3.48), maka diperoleh ;

Tegangan pada serat atas dan bawah No nodal 2 adalah

f atas = f atas (akibat momen saat servis) + f atas (akibat kabel atas) + f atas (akibat kabel bawah)

= - 0,6021 + (-1,1231) + 0,7454

= - 0,9798 Mpa

f bawah = f bawah (akibat momen saat servis) + f bawah (akibat kabel atas) + f bawah (akibat kabel bawah)

= 0,8168 + 0,2361 + (-4,7127)

= - 3,6598 Mpa

Untuk tegangan selanjutnya dapat dilihat pada tabel 4.19

Tabel 4.19 Tegangan saat transfer yang terjadi saat servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	2.5	-0.6021	0.8168	-1.1231	0.2361	0.7454	-4.7127	-0.9798	-3.6598
3	5.0	-1.0401	1.4081	-2.2434	0.4718	0.7757	-4.6928	-2.5078	-2.8129
4	7.5	-1.3078	1.7643	-3.3582	0.7071	1.5404	-9.3164	-3.1256	-6.8450
5	10.0	-1.4035	1.8840	-4.4649	0.9416	1.5258	-9.2220	-4.3426	-6.3964
6	12.5	-1.3299	1.7741	-5.5606	1.1750	1.5067	-9.1021	-5.3838	-6.1530
7	15.0	-1.0936	1.4480	-6.6431	1.4070	1.4858	-8.9623	-6.2509	-6.1073
8	17.5	-0.7049	0.9254	-7.7095	1.6373	1.4610	-8.8015	-6.9534	-6.2388
9	20.0	-0.1771	0.2302	-8.7592	1.8657	1.4339	-8.6217	-7.5024	-6.5258
10	22.5	0.4746	-0.6101	-9.7887	2.0917	1.4055	-8.4281	-7.9086	-6.9465
11	25.0	1.2336	-1.5670	-10.7967	2.3143	0.6878	-4.1113	-8.8753	-3.3640
12	27.5	2.0830	-2.6118	-12.6424	2.5005	0.6721	-4.0025	-9.8873	-4.1138
13	30.0	3.0053	-3.7165	-14.6656	2.9588	-	-	-11.6603	-0.7577
14	32.5	3.9840	-4.8554	-16.6430	3.4108	-	-	-12.6590	-1.4446
15	35.0	5.0032	-6.0053	-17.7162	3.8505	-	-	-12.7130	-2.1548
16	37.5	6.0485	-7.1458	-19.4225	4.0662	-	-	-13.3740	-3.0796
17	40.0	7.1065	-8.2603	-21.2623	4.4943	-	-	-14.1558	-3.7660
18	42.5	8.1656	-9.3340	-23.0487	4.5350	-	-	-14.8831	-4.7990
19	45.0	9.2155	-10.3566	-24.7814	5.3216	-	-	-15.5659	-5.0350
20	47.5	10.2482	-11.3197	-25.6191	5.6602	-	-	-15.3709	-5.6595
21	50.0	11.2553	-12.2176	-27.1103	5.8900	-	-	-15.8550	-6.3276
22	52.5	12.2313	-13.0467	-28.6890	6.2662	-	-	-16.4577	-6.7805
23	55.0	13.1715	-13.8063	-29.3838	6.5480	-	-	-16.2123	-7.2583
24	57.5	14.0721	-14.4948	-30.7419	6.7756	-	-	-16.6698	-7.7192
25	60.0	14.9305	-15.1144	-32.1643	7.1185	-	-	-17.2338	-7.9959
26	62.5	15.7446	-15.6653	-32.6226	7.2454	-	-	-16.8780	-8.4199

Lanjutan tabel 4.19 Tegangan saat transfer yang terjadi saat servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
27	65.0	16.5132	-16.1527	-33.7513	7.3752	-	-	-17.2381	-8.7775
28	67.5	17.2354	-16.5785	-34.7533	7.4311	-	-	-17.5179	-9.1474
29	70.0	17.9117	-16.9454	-35.6444	7.4285	-	-	-17.7327	-9.5169
30	72.5	17.0018	-16.3538	-34.7533	7.4311	-	-	-17.7515	-8.9227
31	75.0	16.0188	-15.6691	-33.7513	7.3752	-	-	-17.7325	-8.2939
32	77.5	14.9601	-14.8848	-32.6226	7.2454	-	-	-17.6625	-7.6394
33	80.0	13.8242	-13.9946	-32.1643	7.1185	-	-	-18.3401	-6.8761
34	82.5	12.6101	-12.9889	-30.7419	6.7756	-	-	-18.1318	-6.2133
35	85.0	11.3172	-11.8627	-29.3838	6.5480	-	-	-18.0666	-5.3147
36	87.5	9.9460	-10.6090	-28.6890	6.2662	-	-	-18.7430	-4.3428
37	90.0	8.4977	-9.2242	-27.1103	5.8900	-	-	-18.6126	-3.3342
38	92.5	6.9751	-7.7045	-25.6191	5.6602	-	-	-18.6440	-2.0443
39	95.0	5.3821	-6.0485	-24.7814	5.3216	-	-	-19.3993	-0.7269
40	97.5	3.7248	-4.2578	-23.0487	4.5350	-	-	-19.3239	0.2772
41	100.0	2.0108	-2.3372	-21.2623	4.4943	-	-	-19.2515	2.1571
42	102.5	0.2496	-0.2949	-19.4225	4.0662	0.6081	-3.5405	-18.5648	0.2308
43	105.0	-1.5466	1.8563	-17.7162	3.8505	0.6244	-3.6586	-18.6384	2.0482
44	107.5	-3.3633	4.0990	-16.6430	3.4108	1.2808	-7.5568	-18.7255	-0.0470
45	110.0	-5.1836	6.4104	-14.6656	2.9588	1.9676	-11.6697	-17.8816	-2.3005
46	112.5	-6.9884	8.7624	-12.6424	2.5005	2.6882	-16.0098	-16.9426	-4.7469
47	115.0	-8.7552	11.1210	-10.7967	2.3143	3.4392	-20.5563	-16.1127	-7.1210
48	117.5	-10.4617	13.4484	-9.7887	2.0917	4.2164	-25.2842	-16.034	-9.7441
49	120.0	-12.0814	15.7019	-8.7592	1.8657	5.0185	-30.1759	-15.8221	-12.6083
50	122.5	-13.5890	17.8389	-7.7095	1.6373	5.8388	-35.2058	-15.4597	-15.7296
51	125.0	-14.9591	19.8073	-6.6431	1.4070	5.9452	-35.8492	-15.657	-14.6349
52	127.5	-16.1649	21.5648	-5.5606	1.1750	6.7792	-40.9592	-14.9463	-18.2194

Lanjutan tabel 4.19 Tegangan saat transfer yang terjadi saat servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
53	130.0	-17.1838	23.0669	-4.4649	0.9416	7.2255	-45.4655	-14.4232	-21.457
54	132.5	-17.9962	24.2771	-3.3582	0.7071	7.3362	-46.0873	-14.0182	-21.1031
55	135.0	-20.3715	27.5791	-2.2434	0.4718	7.4001	-46.3583	-15.2148	-18.3074
56	137.5	-20.8872	28.3365	-1.1231	0.2361	7.4652	-46.5586	-14.5451	-17.9860
57	140.0	-20.9116	28.3891	0.0000	0.0000	7.4713	-46.6311	-13.4403	-18.2420
58	142.5	-20.6637	28.0336	-1.1231	0.2361	7.4652	-46.5586	-14.3216	-18.2889
59	145.0	-20.1511	27.2807	-2.2434	0.4718	7.4001	-46.3583	-14.9944	-18.6058
60	147.5	-19.3842	26.1496	-3.3582	0.7071	7.3362	-46.0873	-15.4062	-19.2306
61	150.0	-18.3831	24.6766	-4.4649	0.9416	7.2255	-45.4655	-15.6225	-19.8473
62	152.5	-17.1708	22.9066	-5.5606	1.1750	6.7792	-40.9592	-15.9522	-16.8776
63	155.0	-15.7743	20.8865	-6.6431	1.4070	5.9452	-35.8492	-16.4722	-13.5557
64	157.5	-14.2243	18.6732	-7.7095	1.6373	5.8388	-35.2058	-16.095	-14.8953
65	160.0	-12.5528	16.3148	-8.7592	1.8657	5.0185	-30.1759	-16.2935	-11.9954
66	162.5	-10.7900	13.8705	-9.7887	2.0917	4.2164	-25.2842	-16.3623	-9.3220
67	165.0	-8.9647	11.3870	-10.7967	2.3143	3.4392	-20.5563	-16.3222	-6.8550
68	167.5	-7.1052	8.9089	-12.6424	2.5005	2.6882	-16.0098	-17.0594	-4.6004
69	170.0	-5.2345	6.4733	-14.6656	2.9588	1.9676	-11.6697	-17.9325	-2.2376
70	172.5	-3.3740	4.1120	-16.6430	3.4108	1.2808	-7.5568	-18.7362	-0.034
71	175.0	-1.5418	1.8506	-17.7162	3.8505	0.6244	-3.6586	-18.6336	2.0425
72	177.5	0.2473	-0.2922	-19.4225	4.0662	0.6081	-3.5405	-18.5671	0.2335
73	180.0	1.9815	-2.3032	-21.2623	4.4943	-	-	-19.2808	2.1911
74	182.5	3.6513	-4.1738	-23.0487	4.5350	-	-	-19.3974	0.3612
75	185.0	5.2498	-5.8998	-24.7814	5.3216	-	-	-19.5316	-0.5782
76	187.5	6.7727	-7.4809	-25.6191	5.6602	-	-	-18.8464	-1.8207
77	190.0	8.2162	-8.9186	-27.1103	5.8900	-	-	-18.8941	-3.0286
78	192.5	9.5785	-10.2170	-28.6890	6.2662	-	-	-19.1105	-3.9508

Lanjutan tabel 4.19 Tegangan saat transfer yang terjadi saat servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
105	260.0	-0.1771	0.2302	-8.7592	1.8657	1.4339	-8.6217	-7.5024	-6.5258
106	262.5	-0.7049	0.9254	-7.7095	1.6373	1.4610	-8.8015	-6.9534	-6.2388
107	265.0	-1.0936	1.4480	-6.6431	1.4070	1.4858	-8.9623	-6.2509	-6.1073
108	267.5	-1.3299	1.7741	-5.5606	1.1750	1.5067	-9.1021	-5.3838	-6.1530
109	270.0	-1.4035	1.8340	-4.4649	0.9416	1.5258	-9.2220	-4.3426	-6.3964
110	272.5	-1.3078	1.7543	-3.3582	0.7071	1.5404	-9.3164	-3.1256	-6.8450
111	275.0	-1.0401	1.4081	-2.2434	0.4718	0.7757	-4.6928	-2.5078	-2.8129
112	277.5	-0.6021	0.8168	-1.1231	0.2361	0.7454	-4.7127	-0.9798	-3.6598
113	280.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.15.4 Saat layan akibat momen maksimum pada saat servise

Mengacu pada formula (3.47) dan (3.48), maka diperoleh ;

Tegangan pada serat atas dan bawah No nodal 2 adalah

f atas = f atas (akibat momen maks saat servis) + f atas (akibat kabel atas) + f atas (akibat kabel bawah)

= - 1,2467 + (-0,8985) + 0,5963

= - 1,5489 Mpa

f bawah = f bawah (akibat momen maks saat servis) + f bawah (akibat kabel atas) + f bawah (akibat kabel bawah)

= 1,6913 + 0,1888 + (-3,7702)

= - 1,8901 Mpa

Untuk tegangan selanjutnya dapat dilihat pada tabel 4.20

Tabel 4.20 Tegangan maksimum saat layan yang terjadi tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	2.5	-1.2467	1.6913	-0.8985	0.1888	0.5963	-3.7702	-1.5489	-1.8901
3	5.0	-2.2608	3.0606	-1.7947	0.3774	0.6205	-3.7542	-3.4350	-0.3162
4	7.5	-3.0296	4.0870	-2.6865	0.5657	1.2323	-7.4531	-4.4838	-2.8004
5	10.0	-3.5476	4.7622	-5.7200	0.7533	1.2207	-7.3776	-8.0469	-1.8621
6	12.5	-3.8153	5.0898	-4.4485	0.9400	1.2053	-7.2816	-7.0585	-1.2518
7	15.0	-3.8394	5.0837	-5.3145	1.1256	1.1886	-7.1698	-7.9653	-0.9605
8	17.5	-3.6320	4.7680	-6.1676	1.3098	1.1687	-7.0412	-8.6309	-0.9634
9	20.0	-3.2105	4.1726	-7.0074	1.4925	1.1471	-6.8974	-9.0708	-1.2323
10	22.5	-2.5946	3.3354	-7.8310	1.6734	1.1244	-6.7424	-9.3012	-1.7336
11	25.0	-1.8070	2.2952	-8.6374	1.8514	0.5503	-3.2890	-9.8941	0.8576
12	27.5	-0.8716	1.0929	-10.1140	2.0004	0.5376	-3.2020	-10.4480	-0.1087
13	30.0	0.1874	-0.2318	-11.7325	2.3671	-	-	-11.5451	2.1353
14	32.5	1.3461	-1.6406	-13.3144	2.7287	-	-	-11.9683	1.0881
15	35.0	2.5817	-3.0988	-14.1730	3.0804	-	-	-11.5913	-0.0184
16	37.5	3.9395	-4.6542	-15.5380	3.2530	-	-	-11.5985	-1.4012
17	40.0	5.3269	-6.1917	-17.0099	3.5955	-	-	-11.6830	-2.5962
18	42.5	6.7265	-7.6889	-18.4390	3.6280	-	-	-11.7125	-4.0609
19	45.0	8.1232	-9.1290	-19.8251	4.2573	-	-	-11.7019	-4.8717
20	47.5	9.5044	-10.4982	-21.4953	4.5282	-	-	-11.9909	-5.9700
21	50.0	10.8583	-11.7866	-21.6883	4.7120	-	-	-10.8300	-7.0746
22	52.5	12.1761	-12.9878	-22.9512	5.0130	-	-	-10.7751	-7.9748
23	55.0	13.4504	-14.0987	-23.5070	5.2384	-	-	-10.0566	-8.8603
24	57.5	14.6754	-15.1162	-24.5935	5.4205	-	-	-9.9181	-9.6957
25	60.0	15.8467	-16.0420	-25.7315	5.6948	-	-	-9.8848	-10.3472
26	62.5	16.7981	-16.7135	-26.0981	5.7963	-	-	-9.3000	-10.9172

Tabel 4.20 Tegangan maksimum saat layan yang terjadi tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	2.5	-1.2467	1.6913	-0.8985	0.1888	0.5963	-3.7702	-1.5489	-1.8901
3	5.0	-2.2608	3.0606	-1.7947	0.3774	0.6205	-3.7542	-3.4350	-0.3162
4	7.5	-3.0296	4.0870	-2.6865	0.5657	1.2323	-7.4531	-4.4838	-2.8004
5	10.0	-3.5476	4.7622	-5.7200	0.7533	1.2207	-7.3776	-8.0469	-1.8621
6	12.5	-3.8153	5.0898	-4.4485	0.9400	1.2053	-7.2816	-7.0585	-1.2518
7	15.0	-3.8394	5.0837	-5.3145	1.1256	1.1886	-7.1698	-7.9653	-0.9605
8	17.5	-3.6320	4.7680	-6.1676	1.3098	1.1687	-7.0412	-8.6309	-0.9634
9	20.0	-3.2105	4.1726	-7.0074	1.4925	1.1471	-6.8974	-9.0708	-1.2323
10	22.5	-2.5946	3.3354	-7.8310	1.6734	1.1244	-6.7424	-9.3012	-1.7336
11	25.0	-1.8070	2.2952	-8.6374	1.8514	0.5503	-3.2890	-9.8941	0.8576
12	27.5	-0.8716	1.0929	-10.1140	2.0004	0.5376	-3.2020	-10.4480	-0.1087
13	30.0	0.1874	-0.2318	-11.7325	2.3671	-	-	-11.5451	2.1353
14	32.5	1.3461	-1.6406	-13.3144	2.7287	-	-	-11.9683	1.0881
15	35.0	2.5817	-3.0988	-14.1730	3.0804	-	-	-11.5913	-0.0184
16	37.5	3.9395	-4.6542	-15.5380	3.2530	-	-	-11.5985	-1.4012
17	40.0	5.3269	-6.1917	-17.0099	3.5955	-	-	-11.6830	-2.5962
18	42.5	6.7265	-7.6889	-18.4390	3.6280	-	-	-11.7125	-4.0609
19	45.0	8.1232	-9.1290	-19.8251	4.2573	-	-	-11.7019	-4.8717
20	47.5	9.5044	-10.4982	-21.4953	4.5282	-	-	-11.9909	-5.9700
21	50.0	10.8583	-11.7866	-21.6883	4.7120	-	-	-10.8300	-7.0746
22	52.5	12.1761	-12.9878	-22.9512	5.0130	-	-	-10.7751	-7.9748
23	55.0	13.4504	-14.0987	-23.5070	5.2384	-	-	-10.0566	-8.8603
24	57.5	14.6754	-15.1162	-24.5935	5.4205	-	-	-9.9181	-9.6957
25	60.0	15.8467	-16.0420	-25.7315	5.6948	-	-	-9.8848	-10.3472
26	62.5	16.7981	-16.7135	-26.0981	5.7963	-	-	-9.3000	-10.9172

Lampiran tabel 4.20 Tegangan maksimum saat layan yang terjadi tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
27	65.0	17.6353	-17.2503	-27.0010	5.9002	-	-	-9.3657	-11.3501
28	67.5	18.4217	-17.7196	-27.8026	5.9448	-	-	-9.3809	-11.7748
29	70.0	19.1576	-18.1241	-28.5155	5.9428	-	-	-9.3579	-12.1813
30	72.5	18.4890	-17.7843	-27.8026	5.9448	-	-	-9.3136	-11.8395
31	75.0	17.4266	-17.0462	-27.0010	5.9002	-	-	-9.5744	-11.1460
32	77.5	16.2813	-16.1993	-26.0981	5.7963	-	-	-9.8168	-10.4030
33	80.0	15.0512	-15.2367	-25.7315	5.6948	-	-	-10.6803	-9.5419
34	82.5	13.7355	-14.1480	-24.5935	5.4205	-	-	-10.8580	-8.7275
35	85.0	12.3333	-12.9277	-23.5070	5.2384	-	-	-11.1737	-7.6893
36	87.5	10.8451	-11.5681	-22.9512	5.0130	-	-	-12.1061	-6.5551
37	90.0	9.2724	-10.0651	-21.6883	4.7120	-	-	-12.4159	-5.3531
38	92.5	7.6182	-8.4147	-21.4953	4.5282	-	-	-13.8771	-3.8865
39	95.0	5.8866	-6.6155	-19.8251	4.2573	-	-	-13.9385	-2.3582
40	97.5	4.0846	-4.6691	-18.4390	3.6280	-	-	-14.3544	-1.0411
41	100.0	2.2203	-2.5808	-17.0099	3.5955	-	-	-14.7896	1.0147
42	102.5	-0.1489	0.1759	-15.5380	3.2530	0.4865	-2.8324	-15.2004	0.5965
43	105.0	-2.5006	3.0014	-14.1730	3.0804	0.4995	-2.9269	-15.4741	3.1549
44	107.5	-4.8844	5.9528	-13.3144	2.7287	1.0247	-6.0407	-16.4741	2.6408
45	110.0	-7.2781	9.0005	-11.7325	2.3671	1.5740	-9.3358	-16.7366	2.0318
46	112.5	-9.6562	12.1074	-10.1140	2.0004	2.1506	-12.8078	-16.9196	1.3000
47	115.0	-11.9889	15.2284	-8.6374	1.8514	2.7513	-16.4450	-17.1750	0.6348
48	117.5	-14.2521	18.3209	-7.8310	1.6734	3.7143	-20.2273	-17.6688	-0.2330
49	120.0	-16.4456	21.3740	-7.0074	1.4925	4.4338	-24.1407	-18.3192	-1.2742
50	122.5	-18.4970	24.2818	-6.1676	1.3098	5.1912	-28.1646	-18.7734	-2.5730
51	125.0	-20.3715	26.9737	-5.3145	1.1256	5.5560	-28.6794	-19.2300	-0.5801
52	127.5	-22.0319	29.3916	-4.4485	0.9400	6.2462	-32.6274	-19.3342	-2.2958

Lampiran tabel 4.20 Tegangan maksimum saat layan yang terjadi tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momer		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
53	130.0	-23.4465	31.4737	-5.7200	0.7533	6.7654	-36.4524	-20.1511	-4.2254
54	132.5	-24.5875	33.1638	-2.6865	0.5657	7.0310	-36.8698	-19.3430	-3.1353
55	135.0	-27.8745	37.7368	-1.7947	0.3774	7.1058	-37.0867	-20.3134	1.0275
56	137.5	-28.6274	38.8371	-0.8985	0.1888	7.2008	-37.2469	-20.0751	1.7790
57	140.0	-28.7119	38.9785	0.0000	0.0000	7.3221	-37.3049	-19.1398	1.6736
58	142.5	-28.3210	38.4220	-0.8985	0.1888	7.2008	-37.2469	-20.0751	1.3639
59	145.0	-27.5730	37.3285	-1.7947	0.3774	7.1058	-37.0867	-20.3134	0.6192
60	147.5	-26.4839	35.7272	-2.6865	0.5657	7.0310	-36.8698	-19.343	-0.5769
61	150.0	-25.0828	33.6701	-5.7200	0.7533	6.7654	-36.4524	-20.1511	-2.0290
62	152.5	-23.4028	31.2203	-4.4485	0.9400	6.2462	-32.6274	-19.3342	-0.4671
63	155.0	-21.4816	28.4435	-5.3145	1.1256	5.5560	-28.6794	-19.23	0.8897
64	157.5	-19.3618	25.4175	-6.1676	1.3098	5.1912	-28.1646	-18.7734	-1.4373
65	160.0	-17.0873	22.2083	-7.0074	1.4925	4.4338	-24.1407	-18.3192	-0.4399
66	162.5	-14.6993	18.8958	-7.8310	1.6734	3.7143	-20.2273	-17.6688	0.3419
67	165.0	-12.2367	15.5431	-8.6374	1.8514	2.7513	-16.4450	-17.175	0.9495
68	167.5	-9.8176	12.3099	-10.1140	2.0004	2.1506	-12.8078	-16.9196	1.5025
69	170.0	-7.3496	9.0889	-11.7325	2.3671	1.5740	-9.3358	-16.7366	2.1202
70	172.5	-4.9000	5.9718	-13.3144	2.7287	1.0247	-6.0407	-16.4741	2.6598
71	175.0	-2.4928	2.9921	-14.1730	3.0804	0.4995	-2.9269	-15.4741	3.1456
72	177.5	-0.1475	0.1743	-15.5380	3.2530	0.4865	-2.8324	-15.2004	0.5949
73	180.0	2.1205	-2.4648	-17.0099	3.5955	-	-	-14.8894	1.1307
74	182.5	3.8155	-4.3615	-18.4390	3.6280	-	-	-14.6235	-0.7335
75	185.0	5.5536	-6.2413	-19.8251	4.2573	-	-	-14.2715	-1.9840
76	187.5	7.2097	-7.9635	-21.4953	4.5282	-	-	-14.2856	-3.4353
77	190.0	8.7793	-9.5299	-21.6883	4.7120	-	-	-12.9090	-4.8179
78	192.5	10.2604	-10.9444	-22.9512	5.0130	-	-	-12.6908	-5.9314

Lampiran tabel 4.20 Tegangan maksimum saat layan yang terjadi tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
79	195.0	11.6533	-12.2149	-23.5070	5.2384	-	-	-11.8537	-6.9765
80	197.5	12.9571	-13.3463	-24.5935	5.4205	-	-	-11.6364	-7.9258
81	200.0	14.1749	-14.3496	-25.7315	5.6948	-	-	-11.5566	-8.6548
82	202.5	16.0998	-16.0187	-26.0981	5.7963	-	-	-9.9983	-10.2224
83	205.0	17.2483	-16.8718	-27.0010	5.9002	-	-	-9.7527	-10.9716
84	207.5	18.3141	-17.6161	-27.8026	5.9448	-	-	-9.4885	-11.6713
85	210.0	19.3000	-18.2588	-28.5155	5.9428	-	-	-9.2155	-12.3160
86	212.5	18.5660	-17.8584	-27.8026	5.9448	-	-	-9.2366	-11.9136
87	215.0	17.7813	-17.3931	-27.0010	5.9002	-	-	-9.2197	-11.4929
88	217.5	16.9454	-16.8601	-26.0981	5.7963	-	-	-9.1527	-11.0638
89	220.0	15.8467	-16.0420	-25.7315	5.6948	-	-	-9.8848	-10.3472
90	222.5	14.6754	-15.1162	-24.5935	5.4205	-	-	-9.9181	-9.6957
91	225.0	13.4504	-14.0987	-23.5070	5.2384	-	-	-10.0566	-8.8603
92	227.5	12.1761	-12.9878	-22.9512	5.0130	-	-	-10.7751	-7.9748
93	230.0	10.8583	-11.7866	-21.6883	4.7120	-	-	-10.8300	-7.0746
94	232.5	9.5044	-10.4982	-21.4953	4.5282	-	-	-11.9909	-5.9700
95	235.0	8.1232	-9.1290	-19.8251	4.2573	-	-	-11.7019	-4.8717
96	237.5	6.7265	-7.6889	-18.4390	3.6280	-	-	-11.7125	-4.0609
97	240.0	5.3269	-6.1917	-17.0099	3.5955	-	-	-11.6830	-2.5962
98	242.5	3.9395	-4.6542	-15.5380	3.2530	-	-	-11.5985	-1.4012
99	245.0	2.5817	-3.0988	-14.1730	3.0804	-	-	-11.5913	-0.0184
100	247.5	1.3461	-1.6406	-13.3144	2.7287	-	-	-11.9683	1.0881
101	250.0	0.1874	-0.2318	-11.7325	2.3671	-	-	-11.5451	2.1353
102	252.5	-0.8716	1.0929	-10.1140	2.0004	0.5376	-3.2020	-10.4480	-0.1087
103	255.0	-1.8070	2.2952	-8.6374	1.8514	0.5503	-3.2890	-9.8941	0.8576
104	257.5	-2.5946	3.3354	-7.8310	1.6734	1.1244	-6.7424	-9.3012	-1.7336

Lampiran tabel 4.20 Tegangan maksimum saat layan yang terjadi tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
105	260.0	-3.2105	4.1726	-7.0074	1.4925	1.1471	-6.8974	-9.0708	-1.2323
106	262.5	-3.6320	4.7680	-6.1676	1.3098	1.1687	-7.0412	-8.3309	-0.9634
107	265.0	-3.8394	5.0837	-5.3145	1.1256	1.1886	-7.1698	-7.9653	-0.9605
108	267.5	-3.8153	5.0898	-4.4485	0.9400	1.2053	-7.2816	-7.0585	-1.2518
109	270.0	-3.5476	4.7622	-5.7200	0.7533	1.2207	-7.3776	-8.0469	-1.8621
110	272.5	-3.0296	4.0870	-2.6865	0.5657	1.2323	-7.4531	-4.4838	-2.8004
111	275.0	-2.2608	3.0606	-1.7947	0.3774	0.6205	-3.7542	-3.4350	-0.3162
112	277.5	-1.2467	1.6913	-0.8985	0.1888	0.5963	-3.7702	-1.5489	-1.8901
113	280.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.15.5 Saat layan akibat momen mimimum pada saat servise

Mengacu pada formula (3.47) dan (3.48), maka diperoleh ;

Tegangan pada serat atas dan bawah untuk No nodal 2 adalah

f atas = f atas (akibat momen min saat servis) + f atas (akibat kabel atas) + f atas (akibat kabel bawah)

= - 0,3002 + (-0,8985) + 0,5963

= - 0,6024 Mpa

f bawah = f bawah (akibat momen min saat servis) + f bawah (akibat kabel atas) + f bawah (akibat kabel bawah)

= 0,4073 + 0,1888 + (-3,7702)

= - 3,1741 Mpa

Untuk tegangan selanjutnya dapat dilihat pada tabel 4.21

Tabel 4.21 Tegangan minimal saat layan yang terjadi saat servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
1	0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	2.5	-0.3002	0.4073	-0.8985	0.1888	0.5963	-3.7702	-0.6024	-3.1741
3	5.0	-0.4220	0.5713	-1.7947	0.3774	0.6205	-3.7542	-1.5962	-2.8055
4	7.5	-0.3635	0.4904	-2.6865	0.5657	1.2323	-7.4531	-1.8177	-6.3970
5	10.0	-0.1276	0.1713	-5.7200	0.7533	1.2207	-7.3776	-4.6269	-6.4530
6	12.5	0.2786	-0.3716	-4.4485	0.9400	1.2053	-7.2816	-2.9646	-6.7132
7	15.0	0.8439	-1.1174	-5.3145	1.1256	1.1886	-7.1698	-3.2820	-7.1616
8	17.5	1.5539	-2.0399	-6.1676	1.3098	1.1687	-7.0412	-3.4450	-7.7713
9	20.0	2.3921	-3.1089	-7.0074	1.4925	1.1471	-6.8974	-3.4682	-8.5138
10	22.5	3.3402	-4.2937	-7.8310	1.6734	1.1244	-6.7424	-3.3664	-9.3627
11	25.0	4.3788	-5.5621	-8.6374	1.8514	0.5503	-3.2890	-3.7083	-6.9997
12	27.5	5.4897	-6.8832	-10.1140	2.0004	0.5376	-3.2020	-4.0867	-8.0848
13	30.0	6.6534	-8.2280	-11.7325	2.3671	-	-	-5.0791	-5.8609
14	32.5	7.8529	-9.5706	-13.3144	2.7287	-	-	-5.4615	-6.8419
15	35.0	9.0719	-10.8889	-14.1730	3.0804	-	-	-5.1011	-7.8085
16	37.5	10.2960	-12.1639	-15.5380	3.2530	-	-	-5.2420	-8.9109
17	40.0	11.5121	-13.3811	-17.0099	3.5955	-	-	-5.4978	-9.7856
18	42.5	12.7091	-14.5276	-18.4390	3.6280	-	-	-5.7299	-10.8996
19	45.0	13.8776	-15.5959	-19.8251	4.2573	-	-	-5.9475	-11.3386
20	47.5	15.0106	-16.5801	-21.4953	4.5282	-	-	-6.4847	-12.0519
21	50.0	16.1006	-17.4771	-21.6883	4.7120	-	-	-5.5877	-12.7651
22	52.5	17.1434	-18.2862	-22.9512	5.0130	-	-	-5.8078	-13.2732
23	55.0	18.1351	-19.0092	-23.5070	5.2384	-	-	-5.3719	-13.7708
24	57.5	19.0735	-19.6464	-24.5935	5.4205	-	-	-5.5200	-14.2259
25	60.0	19.9568	-20.2027	-25.7315	5.6948	-	-	-5.7747	-14.5079
26	62.5	20.8000	-20.6953	-26.0981	5.7963	-	-	-5.2981	-14.8990

Lanjutan tabel 4.21 Tegangan minimal saat layan yang terjadi saat servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
27	65.0	21.7906	-21.3149	-27.0010	5.9002	-	-	-5.2104	-15.4147
28	67.5	22.7155	-21.8498	-27.8026	5.9448	-	-	-5.0871	-15.9050
29	70.0	23.5758	-22.3040	-28.5155	5.9428	-	-	-4.9397	-16.3612
30	72.5	22.4482	-21.5926	-27.8026	5.9448	-	-	-5.3544	-15.6478
31	75.0	21.2226	-20.7593	-27.0010	5.9002	-	-	-5.7784	-14.8591
32	77.5	19.8950	-19.7949	-26.0981	5.7963	-	-	-6.2031	-13.9986
33	80.0	18.4629	-18.6904	-25.7315	5.6948	-	-	-7.2686	-12.9956
34	82.5	16.9241	-17.4324	-24.5935	5.4205	-	-	-7.6694	-12.0119
35	85.0	15.2773	-16.0136	-23.5070	5.2384	-	-	-8.2297	-10.7752
36	87.5	13.5222	-14.4236	-22.9512	5.0130	-	-	-9.4290	-9.4106
37	90.0	11.6598	-12.6566	-21.6883	4.7120	-	-	-10.0285	-7.9446
38	92.5	9.6926	-10.7061	-21.4953	4.5282	-	-	-11.8027	-6.1779
39	95.0	7.6251	-8.5692	-19.8251	4.2573	-	-	-12.2000	-4.3119
40	97.5	5.4645	-6.2464	-18.4390	3.6280	-	-	-12.9745	-2.6184
41	100.0	3.2193	-3.7425	-17.0099	3.5955	-	-	-13.7901	-0.1470
42	102.5	1.1683	-1.3799	-15.5380	3.2530	0.4865	-2.8324	-13.8835	-0.9593
43	105.0	-0.8047	0.9659	-14.1730	3.0804	0.4995	-2.9269	-14.4782	1.1194
44	107.5	-2.8050	3.4183	-13.3144	2.7287	1.0247	-6.0407	-15.0947	0.1066
45	110.0	-4.8148	5.9540	-11.7325	2.3671	1.5740	-9.3358	-14.9731	-1.0147
46	112.5	-6.8128	8.5419	-10.1140	2.0004	2.1506	-12.8078	-14.7760	-2.2655
47	115.0	-8.7746	11.1458	-8.6374	1.8514	2.7513	-16.4450	-14.6607	-3.4480
48	117.5	-10.6702	13.7164	-7.8310	1.6734	3.7143	-20.2273	-14.7869	-4.8375
49	120.0	-12.4347	16.1611	-7.0074	1.4925	4.4338	-24.1407	-15.0083	-6.4871
50	122.5	-14.0783	18.4812	-6.1676	1.3098	5.1912	-28.1646	-15.0547	-8.3736
51	125.0	-15.5733	20.6235	-5.3145	1.1256	5.5560	-28.6794	-15.3318	-6.9333
52	127.5	-16.8900	22.5321	-4.4485	0.9400	6.2462	-32.6274	-15.0923	-9.1553

Lanjutan tabel 4.21 Tegangan minimal saat layan yang terjadi saat servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
53	130.0	-18.0035	24.1672	-5.7200	0.7533	6.7654	-36.4524	-16.9581	-11.5319
54	132.5	-18.8920	25.4854	-2.6865	0.5657	7.0310	-36.8698	-14.5475	-10.8187
55	135.0	-21.4143	28.9908	-1.7947	0.3774	7.1058	-37.0867	-16.1032	-7.7184
56	137.5	-21.9738	29.8106	-0.8985	0.1888	7.2008	-37.2469	-15.6715	-7.2475
57	140.0	-22.0052	29.8737	0.0000	0.0000	7.3221	-37.3049	-14.6831	-7.4312
58	142.5	-21.7387	29.4920	-0.8985	0.1888	7.2008	-37.2469	-15.4364	-7.5661
59	145.0	-21.1827	28.6773	-1.7947	0.3774	7.1058	-37.0867	-15.8716	-8.0320
60	147.5	-20.3491	27.4512	-2.6865	0.5657	7.0310	-36.8698	-16.0046	-8.8529
61	150.0	-19.2599	25.8537	-5.7200	0.7533	6.7654	-36.4524	-18.2145	-9.8454
62	152.5	-17.9410	23.9341	-4.4485	0.9400	6.2462	-32.6274	-16.1433	-7.7533
63	155.0	-16.4219	21.7440	-5.3145	1.1256	5.5560	-28.6794	-16.1804	-5.8098
64	157.5	-14.7366	19.3456	-6.1676	1.3098	5.1912	-28.1646	-15.7130	-7.5092
65	160.0	-12.9199	16.7919	-7.0074	1.4925	4.4338	-24.1407	-15.4935	-5.8563
66	162.5	-11.0050	14.1469	-7.8310	1.6734	3.7143	-20.2273	-15.1217	-4.4070
67	165.0	-8.9845	11.4122	-8.6374	1.8514	2.7513	-16.4450	-14.8706	-3.1814
68	167.5	-6.9265	8.6846	-10.1140	2.0004	2.1506	-12.8078	-14.8899	-2.1226
69	170.0	-4.8619	6.0125	-11.7325	2.3671	1.5740	-9.3358	-15.0204	-0.9562
70	172.5	-2.8139	3.4295	-13.3144	2.7287	1.0247	-6.0407	-15.1036	0.1175
71	175.0	-0.8022	0.9629	-14.1730	3.0804	0.4995	-2.9269	-14.4757	1.1164
72	177.5	1.1575	-1.3675	-15.5380	3.2530	0.4865	-2.8324	-13.8940	-0.9469
73	180.0	3.1729	-3.6880	-17.0099	3.5955	-	-	-13.8370	-0.0925
74	182.5	5.3567	-6.1231	-18.4390	3.6280	-	-	-13.0823	-2.4951
75	185.0	7.4377	-8.3586	-19.8251	4.2573	-	-	-12.3874	-4.1013
76	187.5	9.4114	-10.3954	-21.4953	4.5282	-	-	-12.0839	-5.8672
77	190.0	11.2734	-12.2378	-21.6883	4.7120	-	-	-10.4149	-7.5253
78	192.5	13.0225	-13.8907	-22.9512	5.0130	-	-	-9.9287	-8.8777

Lanjutan tabel 4.21 Tegangan minimal saat layan yang terjadi saat servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
79	195.0	14.6599	-15.3665	-23.5070	5.2384	-	-	-8.8471	-10.1281
80	197.5	16.1854	-16.6715	-24.5935	5.4205	-	-	-8.4081	-11.2510
81	200.0	17.6036	-17.8205	-25.7315	5.6948	-	-	-8.1279	-12.1257
82	202.5	19.8950	-19.7949	-26.0981	5.7963	-	-	-6.2031	-13.9986
83	205.0	21.2226	-20.7593	-27.0010	5.9002	-	-	-5.7784	-14.8591
84	207.5	22.4482	-21.5926	-27.8026	5.9448	-	-	-5.3544	-15.6478
85	210.0	23.5759	-22.3040	-28.5155	5.9428	-	-	-4.9396	-16.3612
86	212.5	22.7155	-21.8498	-27.8026	5.9448	-	-	-5.0871	-15.9050
87	215.0	21.7906	-21.3149	-27.0010	5.9002	-	-	-5.2104	-15.4147
88	217.5	20.8000	-20.6953	-26.0981	5.7963	-	-	-5.2981	-14.8990
89	220.0	19.9568	-20.2027	-25.7315	5.6948	-	-	-5.7747	-14.5079
90	222.5	19.0735	-19.6464	-24.5935	5.4205	-	-	-5.5200	-14.2259
91	225.0	18.1351	-19.0092	-23.5070	5.2384	-	-	-5.3719	-13.7708
92	227.5	17.1434	-18.2862	-22.9512	5.0130	-	-	-5.8078	-13.2732
93	230.0	16.1006	-17.4771	-21.6883	4.7120	-	-	-5.5877	-12.7651
94	232.5	15.0106	-16.5801	-21.4953	4.5282	-	-	-6.4847	-12.0519
95	235.0	13.8776	-15.5959	-19.8251	4.2573	-	-	-5.9475	-11.3386
96	237.5	12.7091	-14.5276	-18.4390	3.6280	-	-	-5.7299	-10.8996
97	240.0	11.5121	-13.3811	-17.0099	3.5955	-	-	-5.4978	-9.7856
98	242.5	10.2960	-12.1639	-15.5380	3.2530	-	-	-5.2420	-8.9109
99	245.0	9.0719	-10.8889	-14.1730	3.0804	-	-	-5.1011	-7.8085
100	247.5	7.8529	-9.5706	-13.3144	2.7287	-	-	-5.4615	-6.8419
101	250.0	6.6534	-8.2280	-11.7325	2.3671	-	-	-5.0791	-5.8609
102	252.5	5.4897	-6.8832	-10.1140	2.0004	0.5376	-3.2020	-4.0867	-8.0848
103	255.0	4.3788	-5.5621	-8.6374	1.8514	0.5503	-3.2890	-3.7083	-6.9997
104	257.5	3.3402	-4.2937	-7.8310	1.6734	1.1244	-6.7424	-3.3664	-9.3627

Lanjutan tabel 4.21 Tegangan minimal saat layan yang terjadi saat servise tiap segmen tumpuan A - D

No nodal	Jarak (m)	Tegangan momen		Tegangan kabel atas		Tegangan kabel bawah		Tegangan total	
		f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)	f atas (Mpa)	f bawah (Mpa)
105	260.0	2.3921	-3.1089	-7.0074	1.4925	1.1471	-6.8974	-3.4682	-8.5138
106	262.5	1.5539	-2.0399	-6.1676	1.3098	1.1687	-7.0412	-3.4450	-7.7713
107	265.0	0.8439	-1.1174	-5.3145	1.1256	1.1886	-7.1698	-3.2820	-7.1616
108	267.5	0.2786	-0.3716	-4.4485	0.9400	1.2053	-7.2816	-2.9646	-6.7132
109	270.0	-0.1276	0.1713	-5.7200	0.7533	1.2207	-7.3776	-4.6269	-6.4530
110	272.5	-0.3635	0.4904	-2.6865	0.5657	1.2323	-7.4531	-1.8177	-6.3970
111	275.0	-0.4220	0.5713	-1.7947	0.3774	0.6205	-3.7542	-1.5962	-2.8055
112	277.5	-0.3002	0.4073	-0.8985	0.1888	0.5963	-3.7702	-0.6024	-3.1741
113	280.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.16 Tegangan Ijin Saat Pelaksanaan

Saat transfer

Tegangan tarik (f_{ti}) = 0,25 = 0,25 = 1,5 Mpa

Tegangan tekan (f_{ci}) = -0,6 . f'_c = -0,6 . (45.0,8) = -21,6 Mpa

Saat layan

Tegangan tarik (f_{ti}) = 0,5 = 0,5 = 3,0 Mpa

Tegangan tekan (f_{ci}) = -0,45 . f'_c = -0,45 . (45.0,8) = -16,2 Mpa

4.17 Tegangan Ijin Saat Servise

Saat transfer

Tegangan tarik (f_{ti}) = 0,25 = 0,25 = 1,677 Mpa

Tegangan tekan (f_{ci}) = -0,6 . f'_c = -0,6 . 45 = -27 Mpa

Saat layan

Tegangan tarik (f_{ti}) = 0,5 = 0,5 = 3,354 Mpa

Tegangan tekan (f_{ci}) = -0,45 . f'_c = -0,45 . 45 = -20,25 Mpa