

## LAMPIRAN 1 CONTOH PERHITUNGAN

### 1.1 UBC 1997

a. Kecepatan Angin 120 km/jam

Parameter :

- $C_e = 2,3$
- $C_q = 3,6$
- $q_s = 0,69 \text{ kN/m}^2$
- $I_w = 1$

$$\begin{aligned}
 P &= C_e \times C_q \times q_s \times I_w \\
 &= 2,3 \times 3,6 \times 0,69 \times 1 \\
 &= 5,6807 \text{ kN/m}^2 = 5680,7 \text{ N/m}^2 = 579,66 \text{ kg/m}^2
 \end{aligned}$$

b. Kecepatan Angin 280 km/jam

Parameter :

- $C_e = 2,3$
- $C_q = 3,6$
- $q_s = 2,074 \text{ kN/m}^2$
- $I_w = 1$

$$\begin{aligned}
 P &= C_e \times C_q \times q_s \times I_w \\
 &= 2,3 \times 3,6 \times 2,074 \times 1 \\
 &= 17,1733 \text{ kN/m}^2 = 17173,3 \text{ N/m}^2 = 1752,38 \text{ kg/m}^2
 \end{aligned}$$

## 1.2 AS/NZS 1170.2.2002

### a. Kecepatan Angin 120 km/jam

Parameter :

- $V_R = 120 \text{ km/jam} = 33,33 \text{ m/det}$
- $M_d = 1$
- $M_{z,cat} = 1,2952$
- $M_s = 1$
- $M_t = 1$
- $C_{p,e} = 0,8$
- $K_a = 0,8$
- $K_c = 1$
- $C_{dyn} = 1 \text{ hertz}$
- $\rho_{air} = 1,2 \text{ kg/m}^3$

$$\begin{aligned} V_{des\theta} &= V_R \times M_d \times M_{z,cat} \times M_s \times M_t \\ &= 33,33 \times 1 \times 1,2952 \times 1 \times 1 \\ &= 43,17 \text{ m/det} \end{aligned}$$

$$\begin{aligned} C_{fig} &= C_{p,e} \times K_a \times K_c \\ &= 0,8 \times 0,8 \times 1 \\ &= 0,64 \end{aligned}$$

$$\begin{aligned} P &= 0,5(\rho_{air}) \times (V_{des,\theta})^2 \times C_{fig} \times C_{dyn} \\ &= 0,5(1,2) \times (43,17)^2 \times 0,64 \times 1 \\ &= 715,75 \text{ Pa} = 72,96 \text{ kg/m}^2 \end{aligned}$$

## b. Kecepatan Angin 280 km/jam

Parameter :

- $V_R = 280 \text{ km/jam} = 77,78 \text{ m/det}$
- $M_d = 1$
- $M_{z,cat} = 1,2952$
- $M_s = 1$
- $M_t = 1$
- $C_{p,e} = 0,8$
- $K_a = 0,8$
- $K_c = 1$
- $C_{dyn} = 1 \text{ hertz}$
- $\rho_{air} = 1,2 \text{ kg/m}^3$

$$\begin{aligned}
 V_{des\theta} &= V_R \times M_d \times M_{z,cat} \times M_s \times M_t \\
 &= 77,78 \times 1 \times 1,2952 \times 1 \times 1 \\
 &= 100,74 \text{ m/det}
 \end{aligned}$$

$$\begin{aligned}
 C_{fig} &= C_{p,e} \times K_a \times K_c \\
 &= 0,8 \times 0,8 \times 1 \\
 &= 0,64
 \end{aligned}$$

$$\begin{aligned}
 P &= 0,5(\rho_{air}) \times (V_{des,\theta})^2 \times C_{fig} \times C_{dyn} \\
 &= 0,5(1,2) \times (100,74)^2 \times 0,64 \times 1 \\
 &= 3896,87 \text{ Pa} = 397,23 \text{ kg/m}^2
 \end{aligned}$$

## LAMPIRAN 2

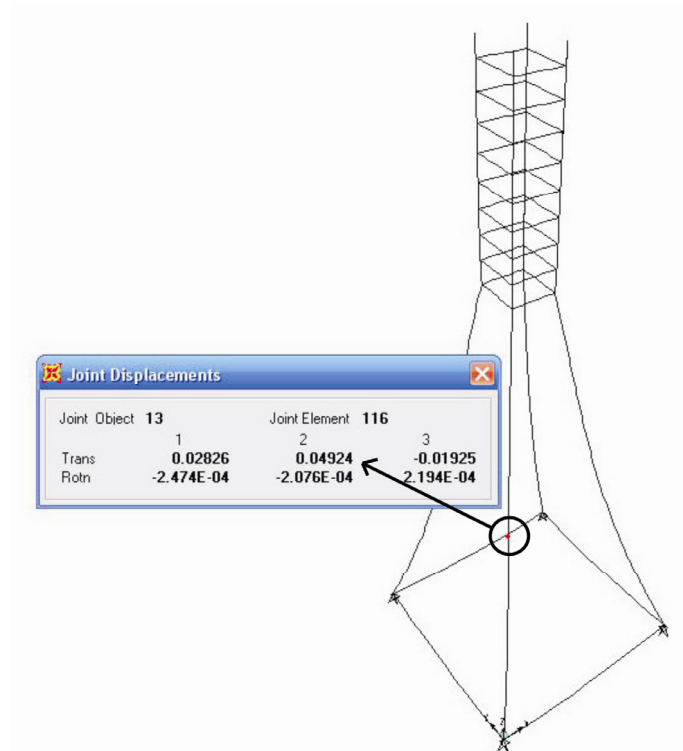
### Hasil Analisis SAP2000

Pemodelan struktur dilakukan dengan beberapa variasi peraturan yang digunakan, dan kecepatan. Analisis dengan SAP2000 secara keseluruhan terdapat 18 kali *running* berdasarkan variasi tersebut.

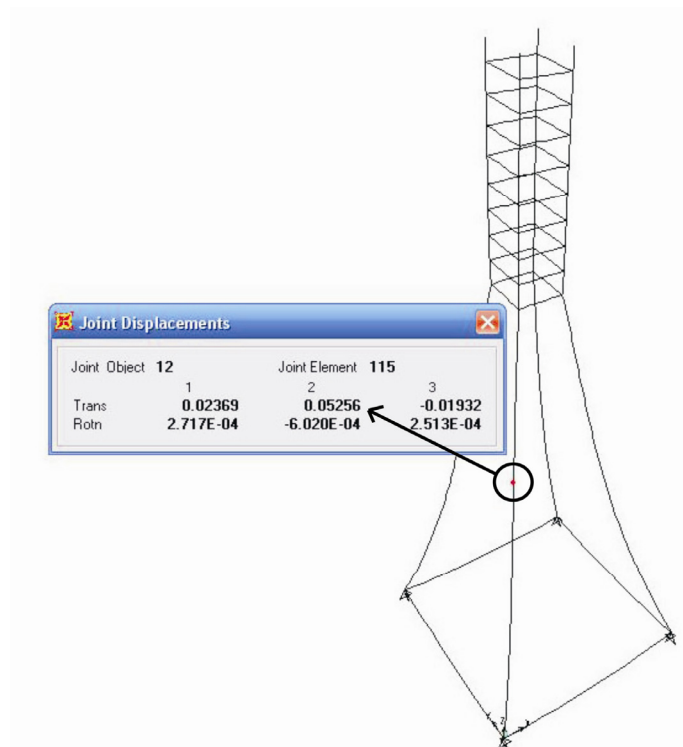
Klasifikasi selengkapnya dapat dilihat pada Tabel L1.1. Sedangkan hasil analisis selengkapnya untuk masing-masing tipe struktur ditampilkan dalam Gambar pada Lampiran 1 berikut.

**Tabel L 1.1 Klasifikasi Pemodelan Struktur**

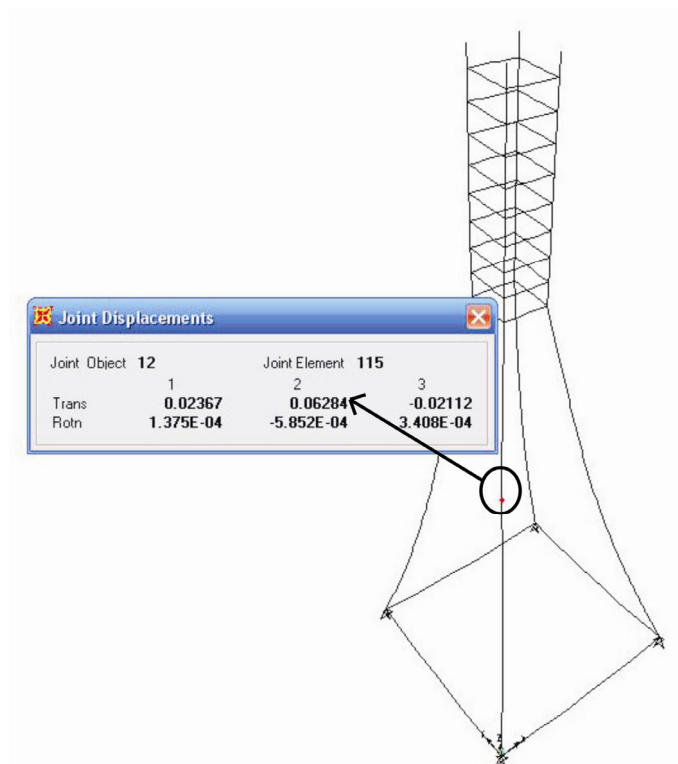
	<b>Model</b>	<b>Peraturan</b>	<b>Kecepatan Angin (km/jam)</b>
1	UB01	UBC97	50, 70, 90 dan 100
2	UB02	UBC97	120
3	UB03	UBC97	140
4	UB04	UBC97	160
5	UB05	UBC97	180
6	UB06	UBC97	200
7	UB07	UBC97	220 dan 280
8	UA01	ANZS	50
9	UA02	ANZS	70
10	UA03	ANZS	90
11	UA04	ANZS	100
12	UA05	ANZS	120
13	UA06	ANZS	140
14	UA07	ANZS	160
15	UA08	ANZS	180
16	UA09	ANZS	200
17	UA10	ANZS	220
18	UA11	ANZS	280



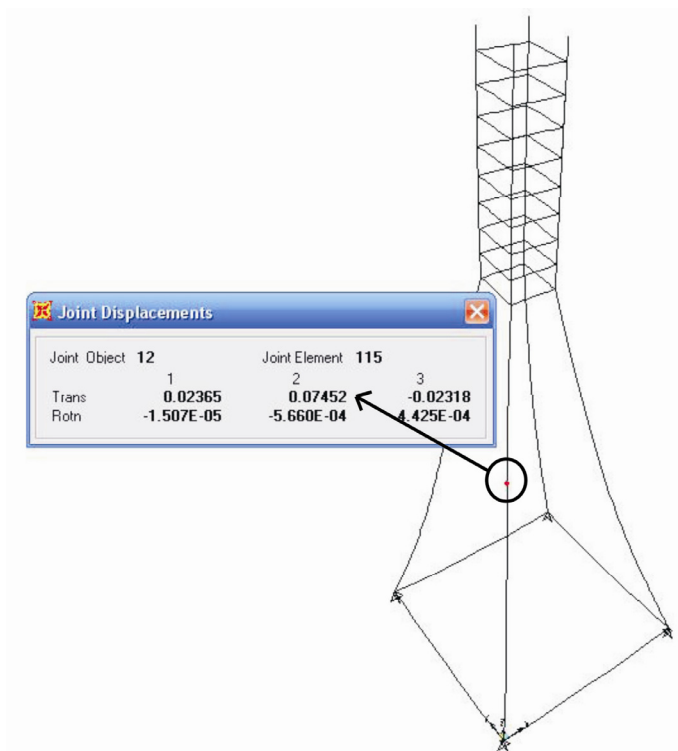
**Gambar L 1.1 Model UB01 (model 1 dan model 2)**



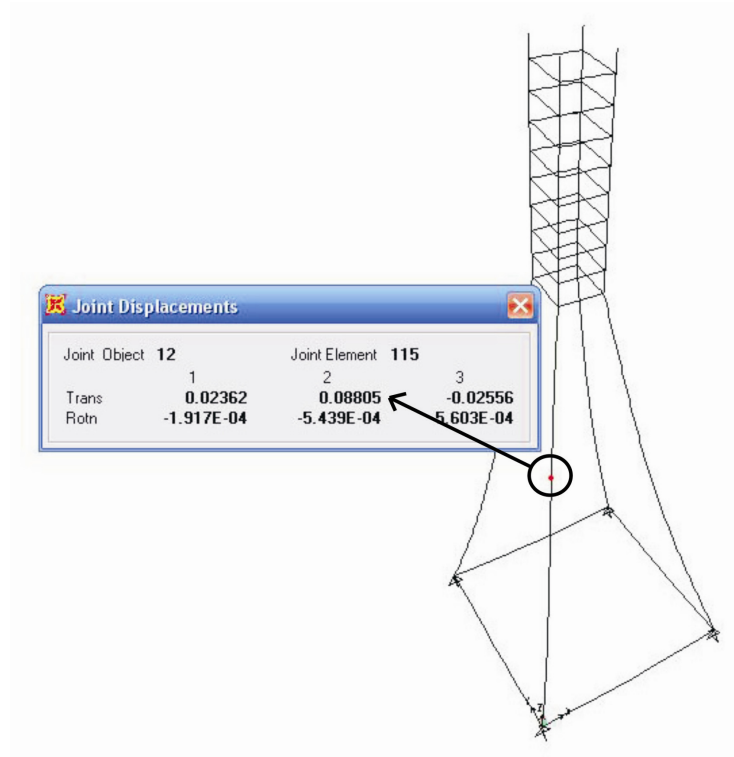
**Gambar L 1.2 Model UB02(model 1 dan model 2)**



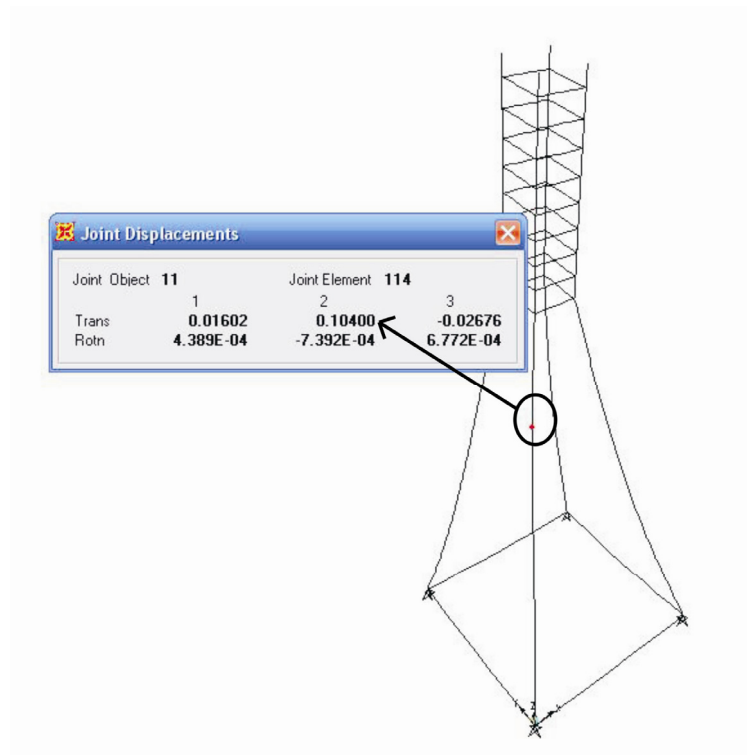
**Gambar L 1.3 Model UB03(model 1 dan model 2)**



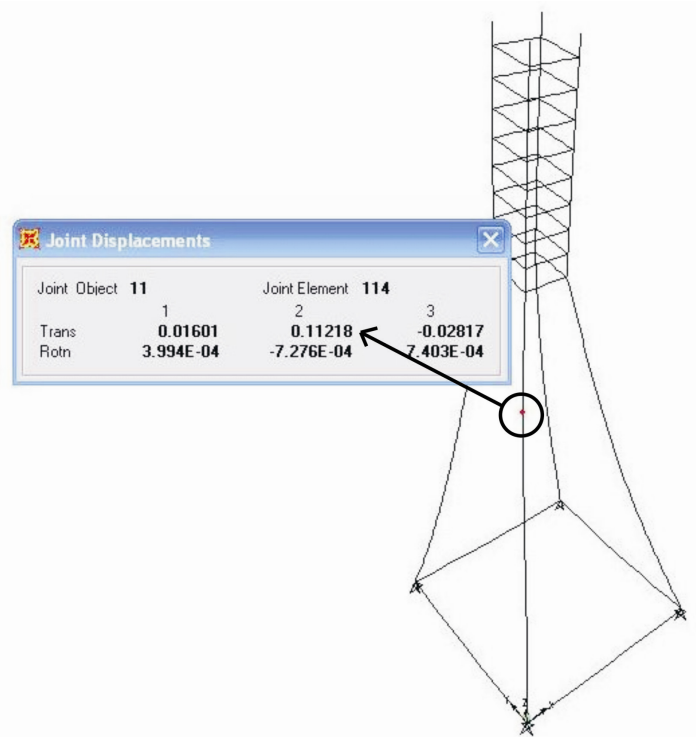
**Gambar L 1.4 Model UB04 (model 1 dan model 2)**



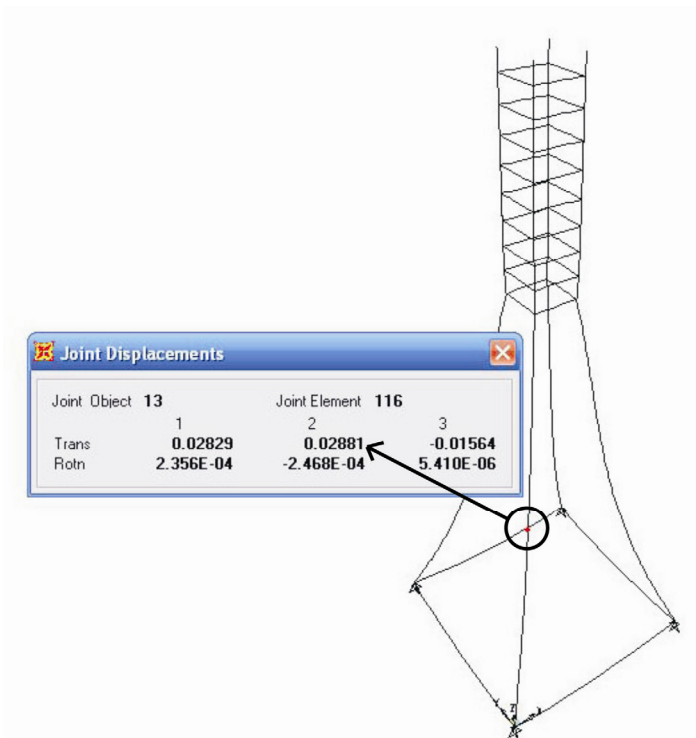
**Gambar L 1.5 Model UB05 (model 1 dan model 2)**



**Gambar L 1.6 Model UB06 (model 1 dan model 2)**

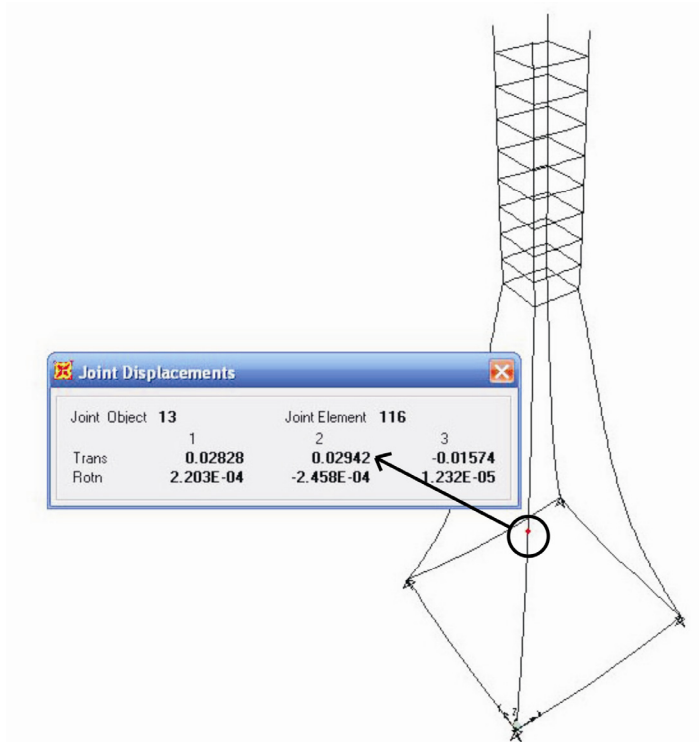


**Gambar L 1.7 Model UB07 (model 1 dan model 2)**

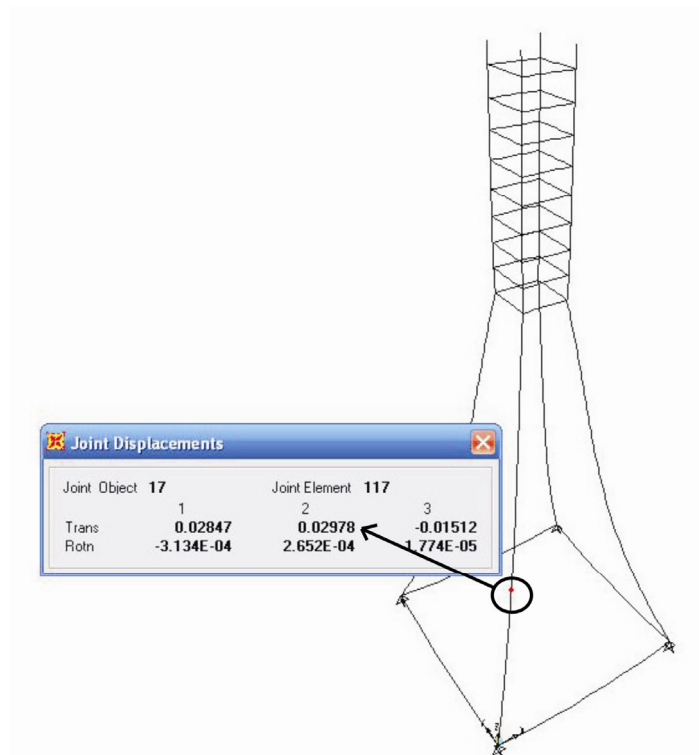


**Gambar L 1.8 Model UA01 (model 1 dan model 2)**

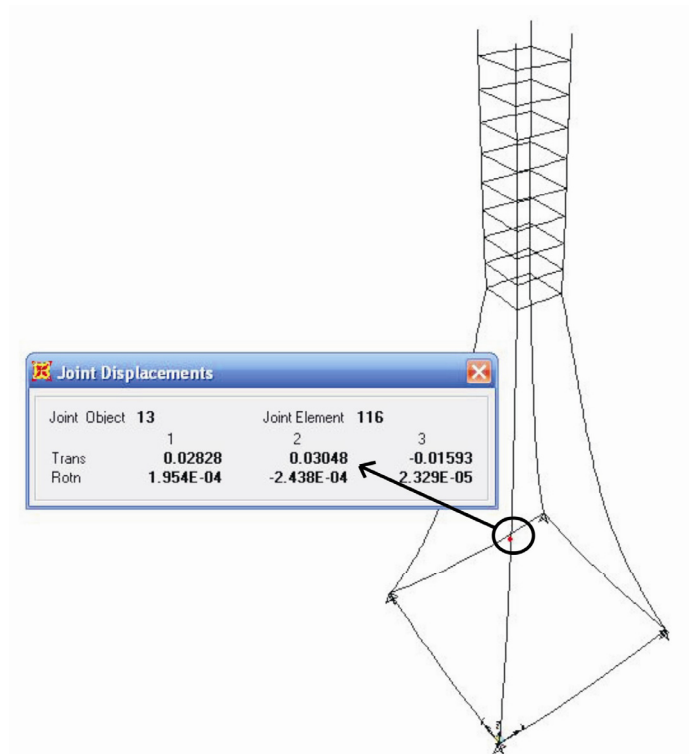




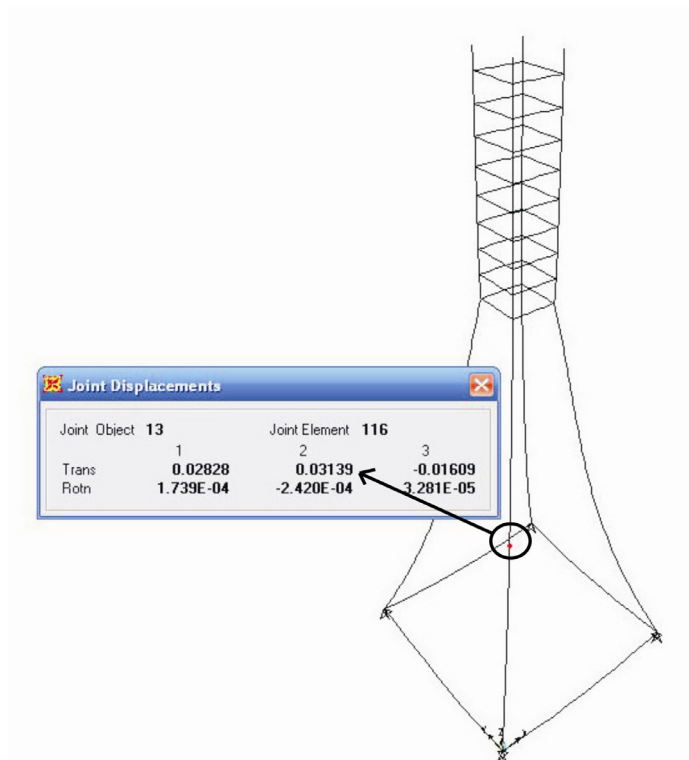
**Gambar L 1.9 Model UA02(model 1 dan model 2)**



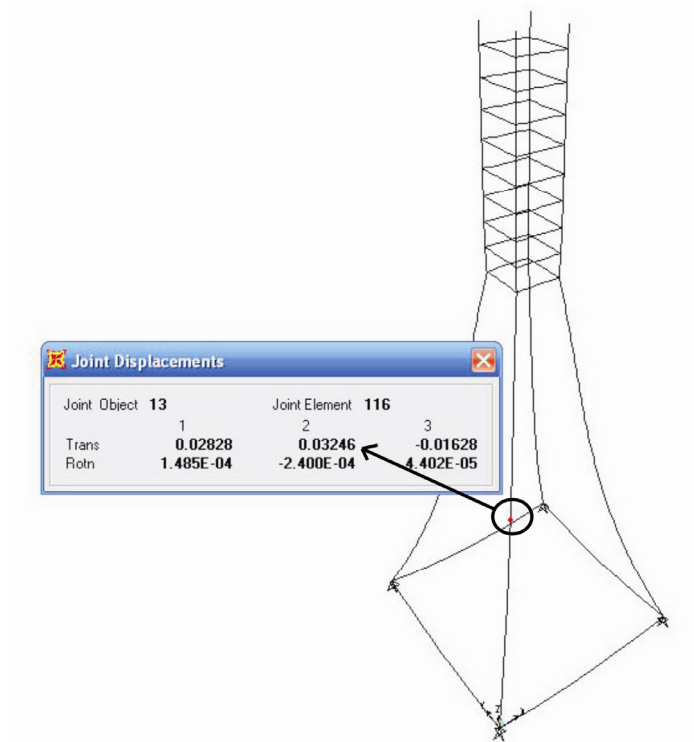
**Gambar L 1.10 Model UA03 (model 1 dan model 2)**



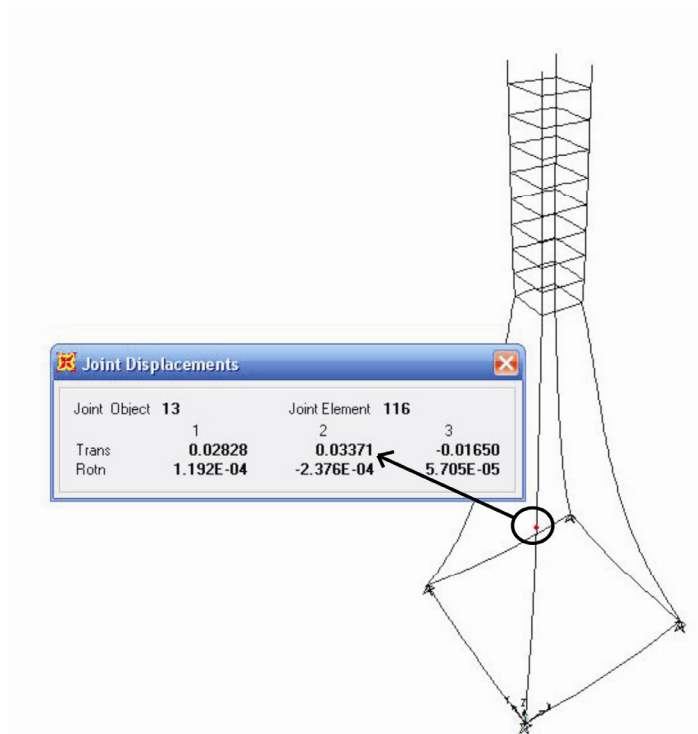
**Gambar L 1.11 Model UA04(model 1 dan model 2)**



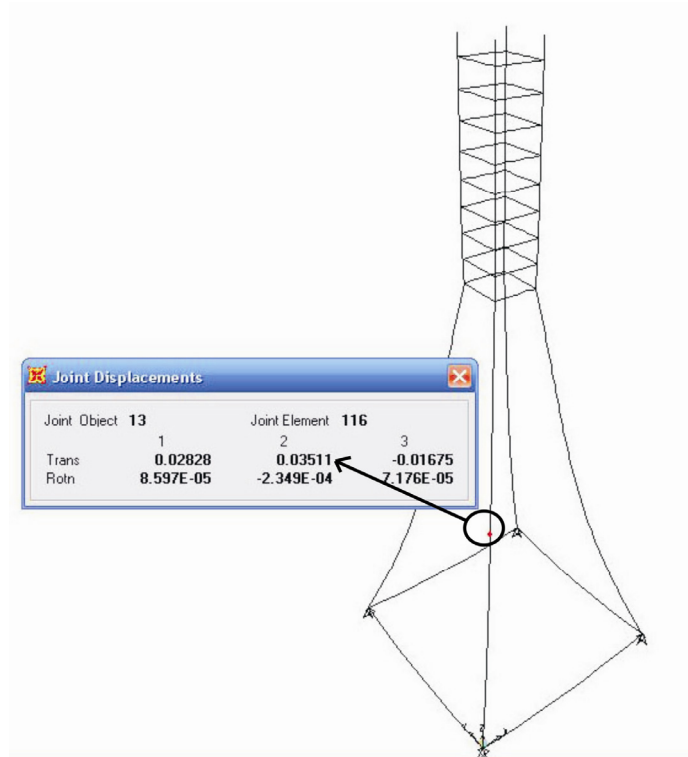
**Gambar L 1.12 Model UA05 (model 1 dan model 2)**



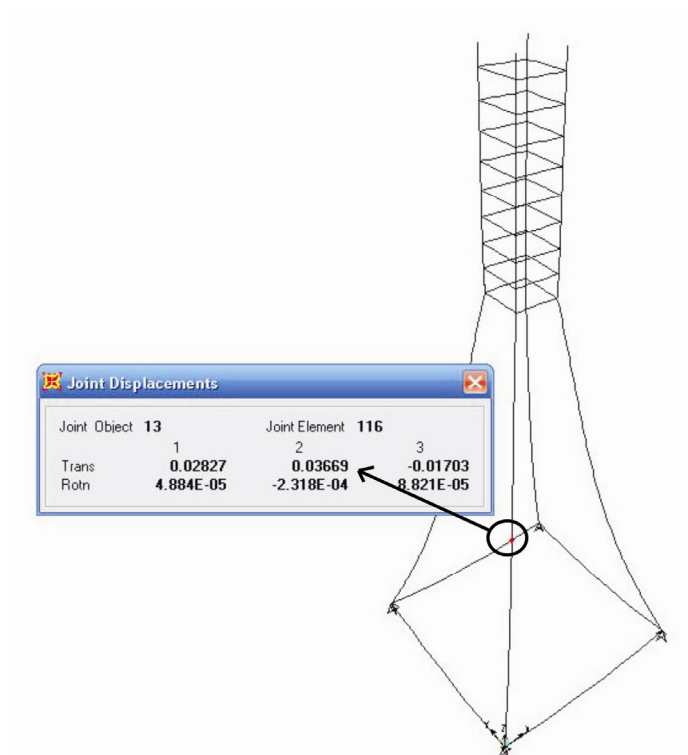
**Gambar L 1.13 Model UA06 (model 1 dan model 2)**



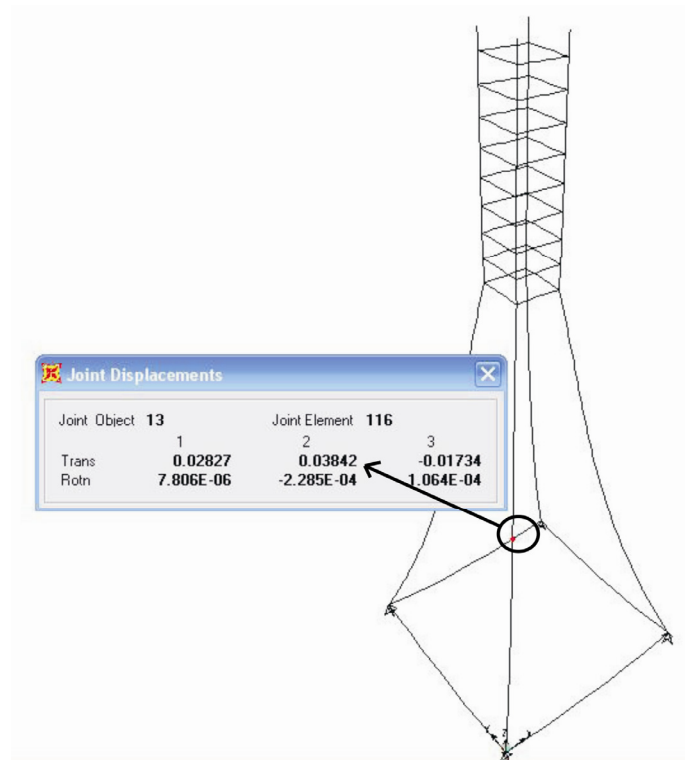
**Gambar L 1.14 Model UA07(model 1 dan model 2)**



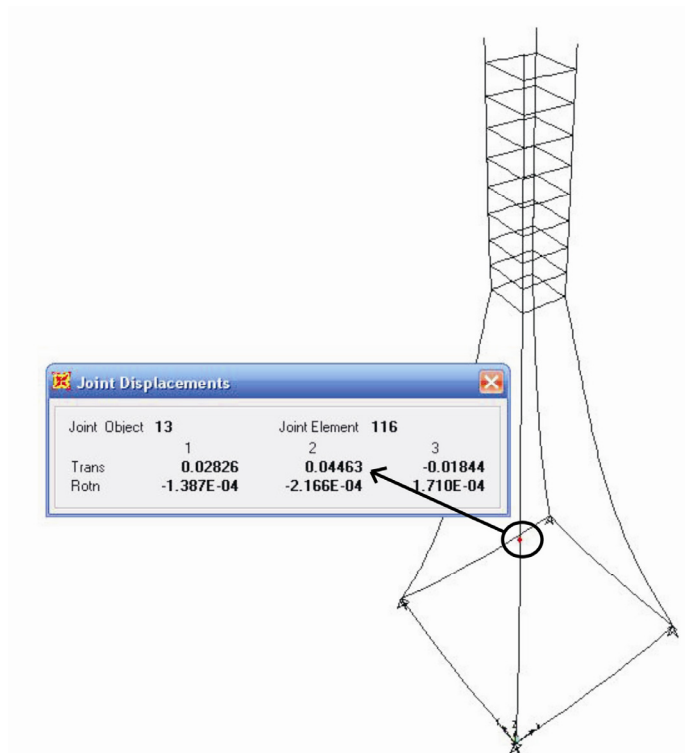
**Gambar L 1.15 Model UA08 (model 1 dan model 2)**



**Gambar L 1.16 Model UA09 (model 1 dan model 2)**



**Gambar L 1.17 Model UA10 (model 1 dan model 2)**



**Gambar L 1.18 Model UA11(model 1 dan model 2)**

## LAMPIRAN 2 PERALIHAN TIAP-TIAP KETINGGIAN

Peralihan struktur yang diperoleh terdiri dari beberapa variasi peraturan yang digunakan, dan kecepatan. Besarnya peralihan selengkapnya ditampilkan dalam Tabel pada Lampiran 2 berikut :

**Tabel L 2.1 Peralihan untuk Kecepatan 50 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0175	0.0140
3	18.6	0.0328	0.0239
4	27.9	0.0438	0.0285
5	37.3	0.0492	0.0288
6	46.6	0.0491	0.0244
7	55.9	0.0443	0.0169
8	65.2	0.0367	0.0086
9	74.5	0.0293	0.0021
10	76.4	0.0282	0.0014
11	78.4	0.0272	0.0009
12	78.5	0.0272	0.0009
13	80.3	0.0264	0.0006
14	82.3	0.0257	0.0005
15	82.5	0.0256	0.0005
16	84.2	0.0250	0.0004
17	86.2	0.0244	0.0004
18	86.5	0.0243	0.0004
19	88.1	0.0237	0.0003
20	90.1	0.0230	0.0004
21	90.5	0.0228	0.0004
22	92.0	0.0223	0.0004
23	93.9	0.0215	0.0005
24	94.5	0.0213	0.0005
25	95.9	0.0207	0.0005
26	97.8	0.0199	0.0005
27	98.5	0.0196	0.0005
28	99.8	0.0190	0.0005
29	101.7	0.0181	0.0004
30	102.5	0.0177	0.0004
31	103.7	0.0172	0.0004
32	105.6	0.0162	0.0004
33	106.5	0.0158	0.0004
34	107.6	0.0153	0.0004
35	109.5	0.0144	0.0004

**Tabel L 2.2 Peralihan untuk Kecepatan 70 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0175	0.0141
3	18.6	0.0328	0.0241
4	27.9	0.0438	0.0293
5	37.3	0.0492	0.0294
6	46.6	0.0491	0.0251
7	55.9	0.0443	0.0178
8	65.2	0.0367	0.0094
9	74.5	0.0293	0.0029
10	76.4	0.0282	0.0022
11	78.4	0.0272	0.0017
12	78.5	0.0272	0.0017
13	80.3	0.0264	0.0014
14	82.3	0.0257	0.0013
15	82.5	0.0256	0.0013
16	84.2	0.0250	0.0012
17	86.2	0.0244	0.0011
18	86.5	0.0243	0.0011
19	88.1	0.0237	0.0011
20	90.1	0.0230	0.0011
21	90.5	0.0228	0.0011
22	92.0	0.0223	0.0011
23	93.9	0.0215	0.0011
24	94.5	0.0213	0.0011
25	95.9	0.0207	0.0011
26	97.8	0.0199	0.0011
27	98.5	0.0196	0.0011
28	99.8	0.0190	0.0010
29	101.7	0.0181	0.0010
30	102.5	0.0177	0.0010
31	103.7	0.0172	0.0010
32	105.6	0.0162	0.0009
33	106.5	0.0158	0.0009
34	107.6	0.0153	0.0009
35	109.5	0.0144	0.0008

**Tabel L 2.3 Peralihan untuk Kecepatan 90 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0175	0.0142
3	18.6	0.0328	0.0244
4	27.9	0.0438	0.0298
5	37.3	0.0492	0.0283
6	46.6	0.0491	0.0259
7	55.9	0.0443	0.0187
8	65.2	0.0367	0.0107

9	74.5	0.0293	0.0038
10	76.4	0.0282	0.0031
11	78.4	0.0272	0.0026
12	78.5	0.0272	0.0026
13	80.3	0.0264	0.0023
14	82.3	0.0257	0.0021
15	82.5	0.0256	0.0021
16	84.2	0.0250	0.0020
17	86.2	0.0244	0.0019
18	86.5	0.0243	0.0019
19	88.1	0.0237	0.0019
20	90.1	0.0230	0.0019
21	90.5	0.0228	0.0019
22	92.0	0.0223	0.0018
23	93.9	0.0215	0.0018
24	94.5	0.0213	0.0018
25	95.9	0.0207	0.0018
26	97.8	0.0199	0.0017
27	98.5	0.0196	0.0017
28	99.8	0.0190	0.0016
29	101.7	0.0181	0.0016
30	102.5	0.0177	0.0015
31	103.7	0.0172	0.0015
32	105.6	0.0162	0.0014
33	106.5	0.0158	0.0014
34	107.6	0.0153	0.0013
35	109.5	0.0144	0.0013

**Tabel L 2.4 Peralihan untuk Kecepatan 100 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0175	0.0143
3	18.6	0.0328	0.0246
4	27.9	0.0438	0.0301
5	37.3	0.0492	0.0305
6	46.6	0.0491	0.0264
7	55.9	0.0443	0.0192
8	65.2	0.0367	0.0109
9	74.5	0.0293	0.0043
10	76.4	0.0282	0.0036
11	78.4	0.0272	0.0031
12	78.5	0.0272	0.0031
13	80.3	0.0264	0.0028
14	82.3	0.0257	0.0026
15	82.5	0.0256	0.0026
16	84.2	0.0250	0.0024
17	86.2	0.0244	0.0024
18	86.5	0.0243	0.0024
19	88.1	0.0237	0.0023
20	90.1	0.0230	0.0023



21	90.5	0.0228	0.0023
22	92.0	0.0223	0.0023
23	93.9	0.0215	0.0022
24	94.5	0.0213	0.0022
25	95.9	0.0207	0.0021
26	97.8	0.0199	0.0021
27	98.5	0.0196	0.0020
28	99.8	0.0190	0.0020
29	101.7	0.0181	0.0019
30	102.5	0.0177	0.0019
31	103.7	0.0172	0.0018
32	105.6	0.0162	0.0017
33	106.5	0.0158	0.0017
34	107.6	0.0153	0.0016
35	109.5	0.0144	0.0015

**Tabel L 2.5 Peralihan untuk Kecepatan 120 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0180	0.0144
3	18.6	0.0340	0.0250
4	27.9	0.0458	0.0307
5	37.3	0.0521	0.0314
6	46.6	0.0526	0.0275
7	55.9	0.0481	0.0204
8	65.2	0.0406	0.0121
9	74.5	0.0331	0.0055
10	76.4	0.0319	0.0048
11	78.4	0.0309	0.0043
12	78.5	0.0308	0.0042
13	80.3	0.0300	0.0039
14	82.3	0.0292	0.0037
15	82.5	0.0291	0.0037
16	84.2	0.0285	0.0035
17	86.2	0.0277	0.0035
18	86.5	0.0276	0.0034
19	88.1	0.0269	0.0034
20	90.1	0.0262	0.0033
21	90.5	0.0260	0.0033
22	92.0	0.0253	0.0032
23	93.9	0.0244	0.0031
24	94.5	0.0242	0.0031
25	95.9	0.0235	0.0030
26	97.8	0.0226	0.0029
27	98.5	0.0222	0.0029
28	99.8	0.0216	0.0028
29	101.7	0.0206	0.0027
30	102.5	0.0201	0.0026
31	103.7	0.0195	0.0026

32	105.6	0.0184	0.0024
33	106.5	0.0180	0.0024
34	107.6	0.0174	0.0023
35	109.5	0.0163	0.0022

**Tabel L 2.6 Peralihan untuk Kecepatan 140 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0194	0.0146
3	18.6	0.0378	0.0255
4	27.9	0.0520	0.0315
5	37.3	0.0606	0.0325
6	46.6	0.0628	0.0288
7	55.9	0.0595	0.0219
8	65.2	0.0523	0.0136
9	74.5	0.0444	0.0070
10	76.4	0.0430	0.0062
11	78.4	0.0418	0.0057
12	78.5	0.0417	0.0056
13	80.3	0.0407	0.0053
14	82.3	0.0397	0.0050
15	82.5	0.0396	0.0050
16	84.2	0.0387	0.0048
17	86.2	0.0377	0.0047
18	86.5	0.0375	0.0047
19	88.1	0.0367	0.0046
20	90.1	0.0355	0.0045
21	90.5	0.0353	0.0045
22	92.0	0.0344	0.0044
23	93.9	0.0332	0.0042
24	94.5	0.0328	0.0042
25	95.9	0.0319	0.0041
26	97.8	0.0306	0.0040
27	98.5	0.0302	0.0039
28	99.8	0.0293	0.0038
29	101.7	0.0279	0.0036
30	102.5	0.0273	0.0036
31	103.7	0.0265	0.0034
32	105.6	0.0250	0.0033
33	106.5	0.0244	0.0032
34	107.6	0.0236	0.0031
35	109.5	0.0221	0.0029

**Tabel L 2.7 Peralihan untuk Kecepatan 160 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0211	0.0148
3	18.6	0.0420	0.0260
4	27.9	0.0591	0.0324
5	37.3	0.0702	0.0337
6	46.6	0.0745	0.0302
7	55.9	0.0724	0.0235
8	65.2	0.0656	0.0153
9	74.5	0.0572	0.0086
10	76.4	0.0557	0.0078
11	78.4	0.0542	0.0073
12	78.5	0.0541	0.0072
13	80.3	0.0529	0.0068
14	82.3	0.0516	0.0066
15	82.5	0.0514	0.0065
16	84.2	0.0503	0.0063
17	86.2	0.0490	0.0062
18	86.5	0.0488	0.0061
19	88.1	0.0476	0.0060
20	90.1	0.0462	0.0059
21	90.5	0.0459	0.0058
22	92.0	0.0447	0.0057
23	93.9	0.0431	0.0056
24	94.5	0.0427	0.0055
25	95.9	0.0415	0.0053
26	97.8	0.0398	0.0051
27	98.5	0.0399	0.0051
28	99.8	0.0380	0.0049
29	101.7	0.0362	0.0047
30	102.5	0.0355	0.0046
31	103.7	0.0344	0.0045
32	105.6	0.0325	0.0042
33	106.5	0.0316	0.0041
34	107.6	0.0306	0.0040
35	109.5	0.0287	0.0037

**Tabel L 2.8 Peralihan untuk Kecepatan 180 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0230	0.0151
3	18.6	0.0468	0.0266
4	27.9	0.0673	0.0335
5	37.3	0.0814	0.0351
6	46.6	0.0881	0.0320
7	55.9	0.0873	0.0254
8	65.2	0.0809	0.0173

9	74.5	0.0721	0.0105
10	76.4	0.0703	0.0097
11	78.4	0.0686	0.0091
12	78.5	0.0685	0.0090
13	80.3	0.0670	0.0086
14	82.3	0.0654	0.0083
15	82.5	0.0652	0.0083
16	84.2	0.0637	0.0080
17	86.2	0.0621	0.0078
18	86.5	0.0618	0.0078
19	88.1	0.0604	0.0076
20	90.1	0.0585	0.0074
21	90.5	0.0581	0.0074
22	92.0	0.0566	0.0072
23	93.9	0.0544	0.0070
24	94.5	0.0540	0.0069
25	95.9	0.0525	0.0067
26	97.8	0.0504	0.0065
27	98.5	0.0496	0.0064
28	99.8	0.0481	0.0062
29	101.7	0.0459	0.0059
30	102.5	0.0449	0.0058
31	103.7	0.0435	0.0056
32	105.6	0.0411	0.0053
33	106.5	0.0400	0.0052
34	107.6	0.0387	0.0050
35	109.5	0.0363	0.0047

**Tabel L 2.9 Peralihan untuk Kecepatan 200 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0251	0.0153
3	18.6	0.0523	0.0273
4	27.9	0.0763	0.0346
5	37.3	0.0939	0.0367
6	46.6	0.1031	0.0340
7	55.9	0.1040	0.0275
8	65.2	0.0981	0.0194
9	74.5	0.0886	0.0126
10	76.4	0.0866	0.0117
11	78.4	0.0846	0.0110
12	78.5	0.0845	0.0110
13	80.3	0.0827	0.0106
14	82.3	0.0807	0.0102
15	82.5	0.0805	0.0102
16	84.2	0.0787	0.0099
17	86.2	0.0767	0.0097
18	86.5	0.0763	0.0097
19	88.1	0.0745	0.0094
20	90.1	0.0720	0.0092

21	90.5	0.0710	0.0091
22	92.0	0.0699	0.0089
23	93.9	0.0675	0.0086
24	94.5	0.0667	0.0085
25	95.9	0.0650	0.0083
26	97.8	0.0622	0.0080
27	98.5	0.0613	0.0078
28	99.8	0.0594	0.0076
29	101.7	0.0566	0.0073
30	102.5	0.0555	0.0071
31	103.7	0.0537	0.0069
32	105.6	0.0508	0.0065
33	106.5	0.0494	0.0064
34	107.6	0.0478	0.0062
35	109.5	0.0449	0.0058

**Tabel L 2.10 Peralihan untuk Kecepatan 220 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0262	0.0156
3	18.6	0.0550	0.0281
4	27.9	0.0808	0.0359
5	37.3	0.1000	0.0384
6	46.6	0.1105	0.0360
7	55.9	0.1122	0.0298
8	65.2	0.1065	0.0218
9	74.5	0.0968	0.0149
10	76.4	0.0946	0.0140
11	78.4	0.0925	0.0133
12	78.5	0.0923	0.0133
13	80.3	0.0904	0.0128
14	82.3	0.0883	0.0124
15	82.5	0.0880	0.0123
16	84.2	0.0861	0.0120
17	86.2	0.0839	0.0117
18	86.5	0.0835	0.0116
19	88.1	0.0815	0.0114
20	90.1	0.0790	0.0111
21	90.5	0.0785	0.0110
22	92.0	0.0765	0.0107
23	93.9	0.0738	0.0104
24	94.5	0.0730	0.0103
25	95.9	0.0709	0.0100
26	97.8	0.0680	0.0096
27	98.5	0.0670	0.0095
28	99.8	0.0650	0.0092
29	101.7	0.0619	0.0088
30	102.5	0.0606	0.0086
31	103.7	0.0587	0.0083

32	105.6	0.0555	0.0079
33	106.5	0.0540	0.0077
34	107.6	0.0523	0.0074
35	109.5	0.0490	0.0070

**Tabel L 2.11 Peralihan untuk Kecepatan 280 km/jam**

TITIK	h (m)	PERALIHAN (m)	
		UBC	ANZS
1	0.0	0.0000	0.0000
2	9.3	0.0262	0.0167
3	18.6	0.0550	0.0308
4	27.9	0.0808	0.0404
5	37.3	0.1000	0.0446
6	46.6	0.1105	0.0435
7	55.9	0.1122	0.0381
8	65.2	0.1065	0.0304
9	74.5	0.0968	0.0232
10	76.4	0.0946	0.0221
11	78.4	0.0925	0.0213
12	78.5	0.0923	0.0212
13	80.3	0.0904	0.0206
14	82.3	0.0883	0.0200
15	82.5	0.0880	0.0200
16	84.2	0.0861	0.0195
17	86.2	0.0839	0.0190
18	86.5	0.0835	0.0189
19	88.1	0.0815	0.0185
20	90.1	0.0790	0.0179
21	90.5	0.0785	0.0178
22	92.0	0.0765	0.0174
23	93.9	0.0738	0.0168
24	94.5	0.0730	0.0166
25	95.9	0.0709	0.0161
26	97.8	0.0680	0.0155
27	98.5	0.0670	0.0153
28	99.8	0.0650	0.0148
29	101.7	0.0619	0.0141
30	102.5	0.0606	0.0139
31	103.7	0.0587	0.0134
32	105.6	0.0555	0.0127
33	106.5	0.0540	0.0123
34	107.6	0.0523	0.0119
35	109.5	0.0490	0.0112