

BAB IV

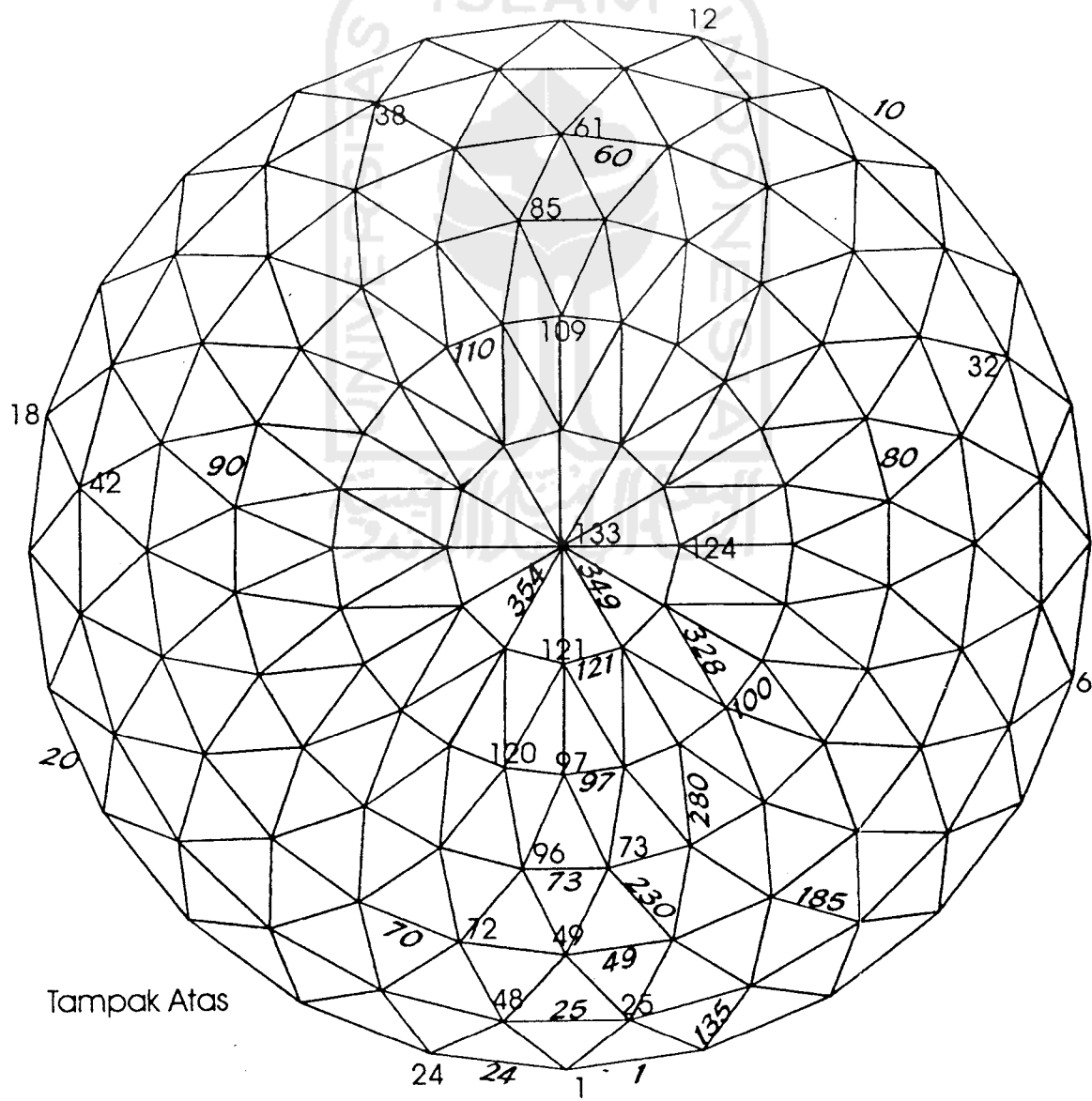
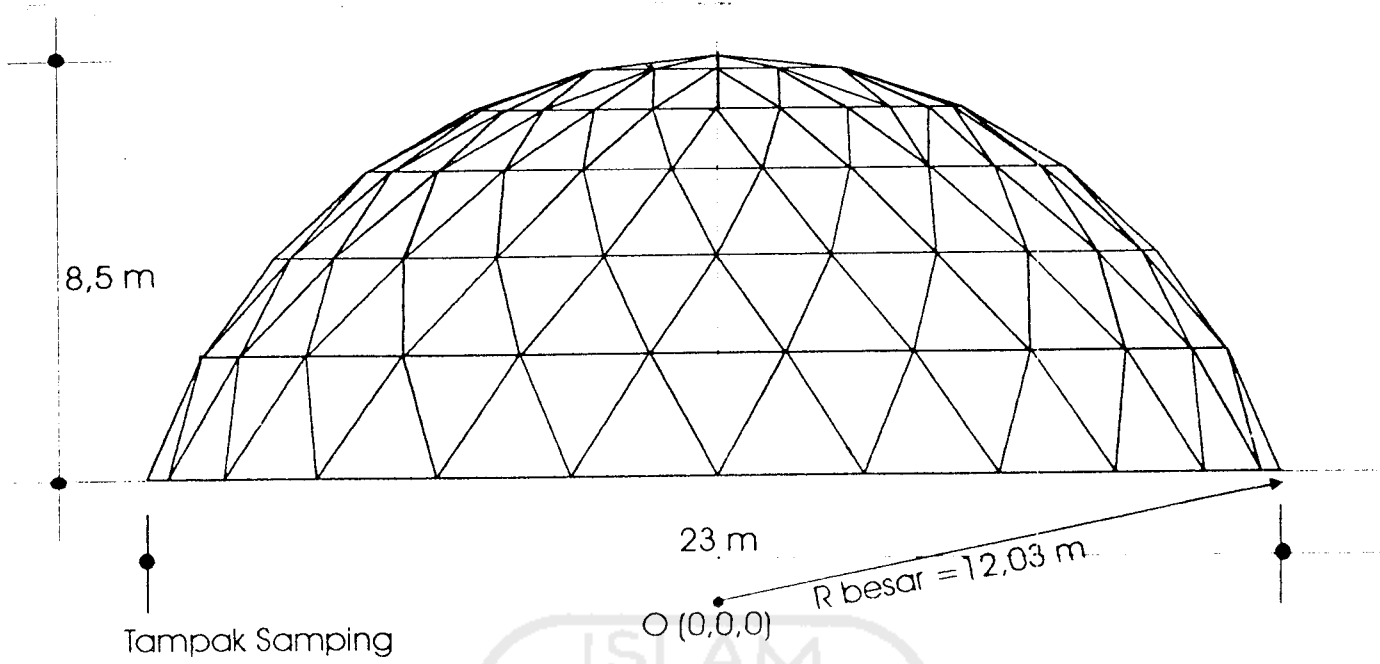
ANALISIS DAN PERHITUNGAN BEBAN

4.1. Data Struktur dan Pembebanan

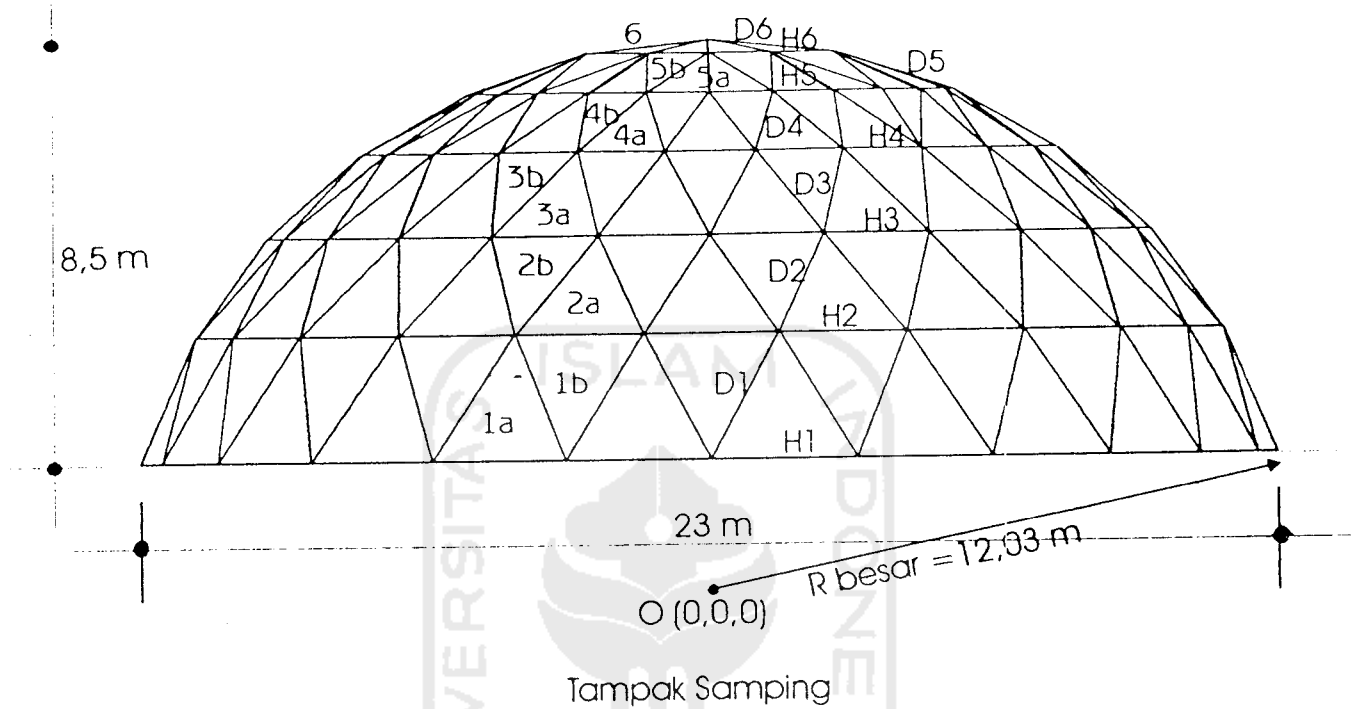
- a. Penutup yang digunakan diasumsikan dengan menggunakan lapisan *fiberglass* dengan tebal 1 cm dengan berat jenis $1,8 \text{ t/m}^3$.
- b. Sebagai asumsi awal dimensi batang digunakan pipa diameter 1,5 inci dengan tebal 0,145 inci.
- c. Berat alat sambung (*ball joint*) diasumsikan 4 kg dengan diameter 4 inci dan berat jenis besi = 450 lbs/ft^3 ($7208,3026 \text{ kg/m}^3$).
- d. Beban hidup diasumsikan sebagai berat dari alat penerangan yang menggantung pada puncak rangka dengan berat 300 kg.
- e. Beban angin diasumsikan diperoleh dari angin yang bekerja dengan tekanan maksimum 30 kg/m^2 .

4.2. Koordinat Joint-joint

Titik O (0,0,0) terletak pada pusat bola. Seluruh koordinat joint dihitung dari titik O. Perhitungan koordinat-koordinat jointnya dihitung dengan persamaan matematika sebagai berikut :

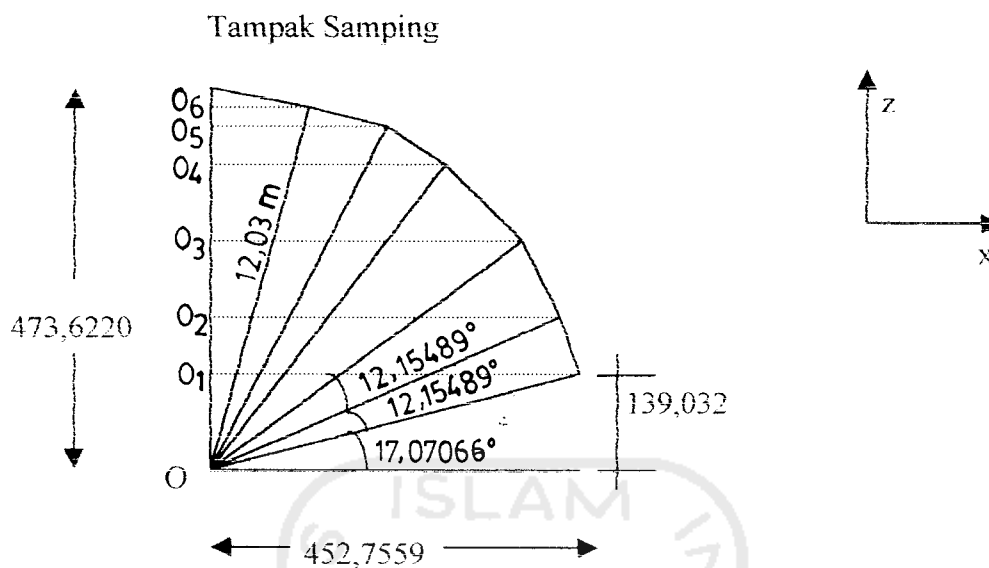


Skala : 1 : 150



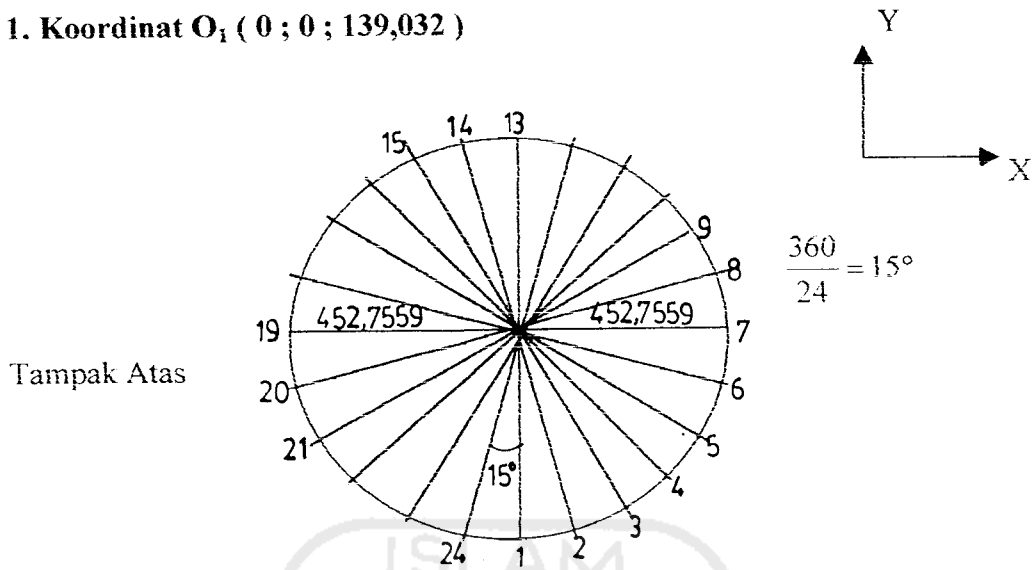
Gambar 4.1 : Layout Struktur Kubah

Titik n → koordinat (Xn , Yn , Zn)



n = 1 s/d n = 24	$Z_n = \sqrt{473,6220^2 - 452,7559^2} = 139,032$ inci
n = 25 s/d n = 48	$Z_n = 473,6220 \cdot \sin (17,07066 + 12,15489) = 231,2453$ inci
n = 49 s/d n = 72	$Z_n = 473,6220 \cdot \sin (17,07066 + 2 \cdot 12,15489) = 313,0906$ inci
n = 73 s/d n = 96	$Z_n = 473,6220 \cdot \sin (17,07066 + 3 \cdot 12,15489) = 380,8980$ inci
n = 97 s/d n = 120	$Z_n = 473,6220 \cdot \sin (17,07066 + 4 \cdot 12,15489) = 431,6276$ inci
n = 121 s/d n = 132	$Z_n = 473,6220 \cdot \sin (17,07066 + 5 \cdot 12,15489) = 463,0043$ inci
n = 133	$Z_n = 473,6220$ inci

1. Koordinat $O_1 (0 ; 0 ; 139,032)$



Untuk $n=1$ s/d $n=24$ $Z_n = \sqrt{473,6220^2 - 452,7559^2} = 139,032$ inci

$n = 1$ s/d $n = 7$ $X_n = 452,7559 \sin \{(n-1) \cdot 15^\circ\} \rightarrow 15^\circ, 30^\circ, 45^\circ, 60^\circ, 75^\circ, 90^\circ$
 $Y_n = -452,7559 \cos \{(n-1) \cdot 15^\circ\}$

$n = 8$ s/d $n = 13$

$X_n = 452,7559 \cos \{(n-7) \cdot 15^\circ\} \rightarrow 15^\circ, 30^\circ, 45^\circ, 60^\circ, 75^\circ, 90^\circ$
 $Y_n = 452,7559 \sin \{(n-7) \cdot 15^\circ\}$

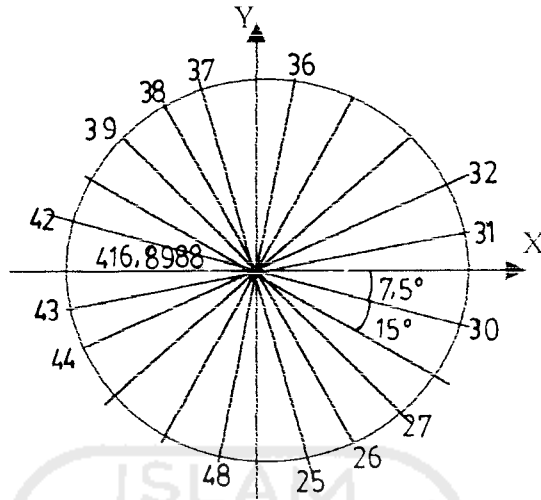
$n = 14$ s/d $n = 19$

$X_n = -452,7559 \sin \{(n-13) \cdot 15^\circ\} \rightarrow 15^\circ, 30^\circ, 45^\circ, 60^\circ, 75^\circ, 90^\circ$
 $Y_n = 452,7559 \cos \{(n-13) \cdot 15^\circ\}$

$n = 20$ s/d $n = 24$

$X_n = -452,7559 \sin \{(n-19) \cdot 15^\circ\} \rightarrow 15^\circ, 30^\circ, 45^\circ, 60^\circ, 75^\circ, 90^\circ$
 $Y_n = -452,7559 \cos \{(n-19) \cdot 15^\circ\}$

2. Koordinat $O_2 (0 ; 0 ; 231,2453)$



Lihat dari gambar tampak samping didapat :

$$473,6220 \cdot \cos (17,07066^\circ + 12,15489^\circ) = 413,3319 \text{ inci}$$

dari gambar diatas didapat : $\frac{413,3319}{\cos 7,5^\circ} = 416,8988 \text{ inci}$

$n = 25 \text{ s/d } n = 48 \quad Z_n = 473,6220 \cdot \sin (17,07066 + 12,15489) = 231,2453 \text{ inci}$

$n = 25 \text{ s/d } n = 30$

$$X_n = 416,8988 \sin \{7,5^\circ + (n - 25) \cdot 15^\circ\} \rightarrow 7,5^\circ; 22,5^\circ; 37,5^\circ; 52,5^\circ; 67,5^\circ; 82,5^\circ$$

$$Y_n = -416,8988 \cos \{7,5^\circ + (n - 25) \cdot 15^\circ\}$$

$n = 31 \text{ s/d } n = 36$

$$X_n = 416,8988 \cos \{7,5^\circ + (n - 25) \cdot 15^\circ\} \rightarrow 7,5^\circ; 22,5^\circ; 37,5^\circ; 52,5^\circ; 67,5^\circ; 82,5^\circ$$

$$Y_n = 416,8988 \sin \{7,5^\circ + (n - 25) \cdot 15^\circ\}$$

$n = 37 \text{ s/d } n = 42$

$$X_n = -416,8988 \sin \{7,5^\circ + (n - 25) \cdot 15^\circ\} \rightarrow 7,5^\circ; 22,5^\circ; 37,5^\circ; 52,5^\circ; 67,5^\circ; 82,5^\circ$$

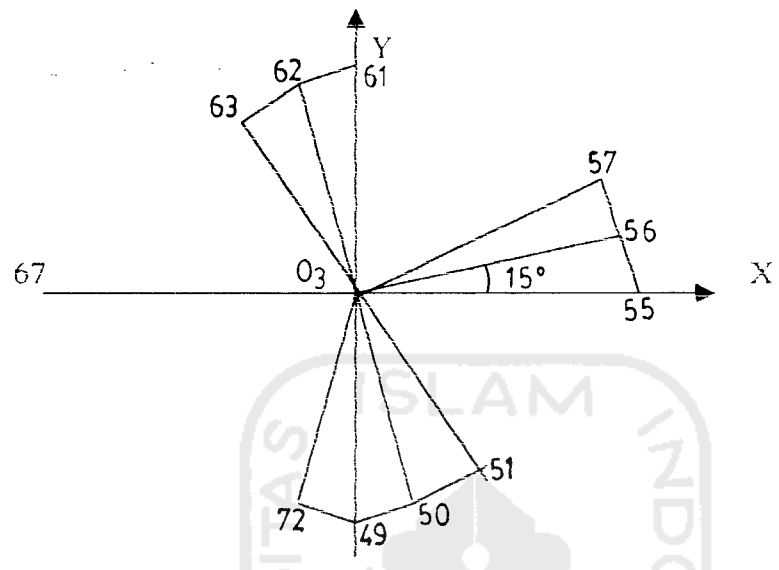
$$Y_n = 416,8988 \cos \{7,5^\circ + (n - 25) \cdot 15^\circ\}$$

$n = 43 \text{ s/d } n = 48$

$$X_n = -416,8988 \cos \{7,5^\circ + (n - 25) \cdot 15^\circ\} \rightarrow 7,5^\circ, 22,5^\circ, 37,5^\circ, 52,5^\circ, 67,5^\circ, 82,5^\circ$$

$$Y_n = -416,8988 \sin \{7,5^\circ + (n - 25) \cdot 15^\circ\}$$

3. Koordinat O₃ (0 ; 0 ; 313,0906)



dari gambar tampak samping didapat :

$$472,6220 \cos (17,07066^\circ + 2 \cdot 12,15489^\circ) = 355,3760$$

n = 49 s/d n = 72 $Z_n = 473,6220 \cdot \sin (17,07066 + 2 \cdot 12,15489) = 313,0906$ inci

n = 49 s/d n = 55

$$X_n = 355,3760 \sin \{(n - 49) \cdot 15^\circ\} \rightarrow 15^\circ, 30^\circ, 45^\circ, 60^\circ, 75^\circ, 90^\circ$$

$$Y_n = -355,3760 \cos \{(n - 49) \cdot 15^\circ\}$$

n = 56 s/d n = 61

$$X_n = 355,3760 \cos \{(n - 55) \cdot 15^\circ\} \rightarrow 15^\circ, 30^\circ, 45^\circ, 60^\circ, 75^\circ, 90^\circ$$

$$Y_n = 355,3760 \sin \{(n - 55) \cdot 15^\circ\}$$

n = 62 s/d n = 67

$$X_n = -355,3760 \sin \{(n - 61) \cdot 15^\circ\} \rightarrow 15^\circ, 30^\circ, 45^\circ, 60^\circ, 75^\circ, 90^\circ$$

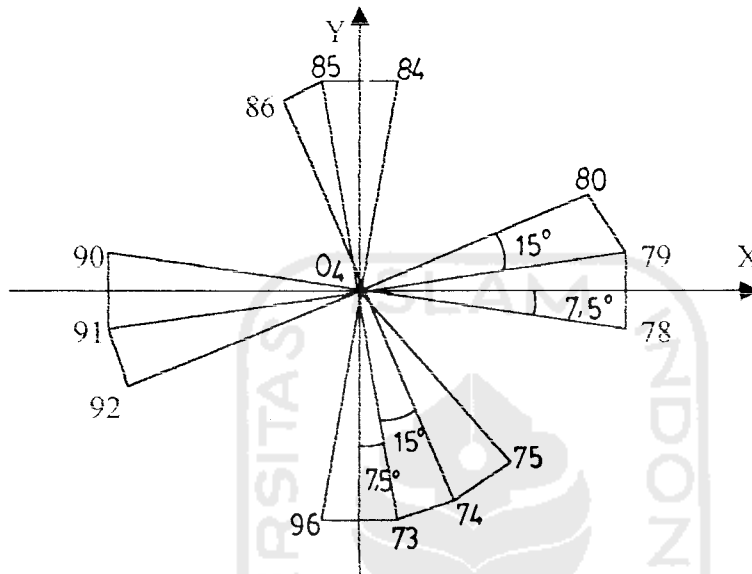
$$Y_n = 355,3760 \cos \{(n - 61) \cdot 15^\circ\}$$

$$n = 68 \text{ s/d } n = 72$$

$$X_n = -355,3760 \cos \{(n - 67) \cdot 15^\circ\} \rightarrow 15^\circ, 30^\circ, 45^\circ, 60^\circ, 75^\circ, 90^\circ$$

$$Y_n = -355,3760 \sin \{(n - 67) \cdot 15^\circ\}$$

4. Koordinat O_4 (0 ; 0 ; 380,8980)



dari gambar tampak samping didapat :

$$473,6220 \cos (17,07066^\circ + 3.12,15489^\circ) = 281,4862 \text{ inci}$$

dari gambar diatas didapat : $\frac{281,4862}{\cos 7,5^\circ} = 283,9154 \text{ inci}$

$$n = 73 \text{ s/d } n = 96 \quad Z_n = 473,6220 \cdot \sin (17,07066 + 3.12,15489) = 380,8980 \text{ inci}$$

$$n = 73 \text{ s/d } n = 78$$

$$X_n = 283,9154 \sin \{7,5^\circ + (n - 73) \cdot 15^\circ\} \rightarrow 7,5^\circ, 22,5^\circ, 37,5^\circ, 52,5^\circ, 67,5^\circ, 82,5^\circ$$

$$Y_n = -283,9154 \cos \{7,5^\circ + (n - 73) \cdot 15^\circ\}$$

$$n = 79 \text{ s/d } n = 84$$

$$X_n = 283,9154 \cos \{7,5^\circ + (n - 79) \cdot 15^\circ\} \rightarrow 7,5^\circ, 22,5^\circ, 37,5^\circ, 52,5^\circ, 67,5^\circ, 82,5^\circ$$

$$Y_n = 283,9154 \sin \{7,5^\circ + (n - 79) \cdot 15^\circ\}$$

$$n = 85 \text{ s/d } n = 90$$

$$X_n = -283,9154 \sin \{7,5^\circ + (n - 85). 15^\circ\} \rightarrow 7,5^\circ; 22,5^\circ; 37,5^\circ; 52,5^\circ; 67,5^\circ; 82,5^\circ$$

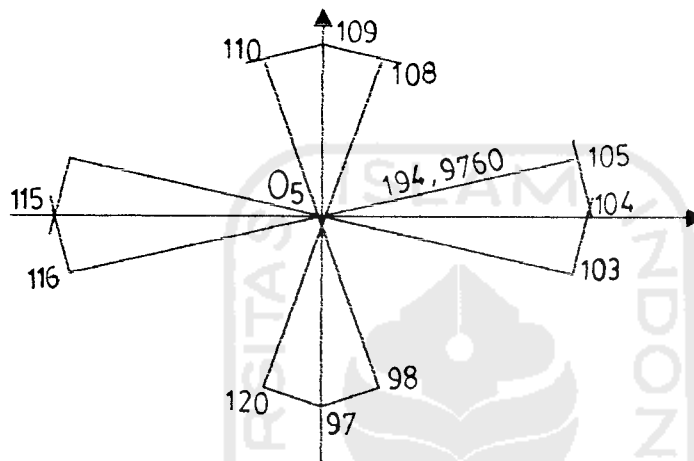
$$Y_n = 283,9154 \cos \{7,5^\circ + (n - 85). 15^\circ\}$$

$n = 91$ s/d $n = 96$

$$X_n = -283,9154 \cos \{7,5^\circ + (n - 91). 15^\circ\} \rightarrow 7,5^\circ; 22,5^\circ; 37,5^\circ; 52,5^\circ; 67,5^\circ; 82,5^\circ$$

$$Y_n = -283,9154 \sin \{7,5^\circ + (n - 91). 15^\circ\}$$

5. Koordinat O_5 (0 ; 0 ; 431,6276)



Dari gambar tampak samping didapat :

$$473,6220 \cos (17,07066^\circ + 4.12,15489^\circ) = 194,9760 \text{ inci}$$

$$n = 97 \text{ s/d } n = 120 \quad Z_n = 473,6220 \cdot \sin (17,07066 + 4.12,15489) = 431,6276 \text{ inci}$$

$n = 97$ s/d $n = 103$

$$X_n = 194,9760 \sin \{(n - 97). 15^\circ\} \rightarrow 15^\circ; 30^\circ; 45^\circ; 60^\circ; 75^\circ; 90^\circ$$

$$Y_n = -194,9760 \cos \{(n - 97). 15^\circ\}$$

$n = 104$ s/d $n = 109$

$$X_n = 194,9760 \cos \{(n - 103). 15^\circ\} \rightarrow 15^\circ; 30^\circ; 45^\circ; 60^\circ; 75^\circ; 90^\circ$$

$$Y_n = 194,9760 \sin \{(n - 103). 15^\circ\}$$

$$n = 110 \text{ s/d } n = 115$$

$$X_n = -194,9760 \sin \{(n - 109) \cdot 15^\circ\} \rightarrow 15^\circ, 30^\circ, 45^\circ, 60^\circ, 75^\circ, 90^\circ$$

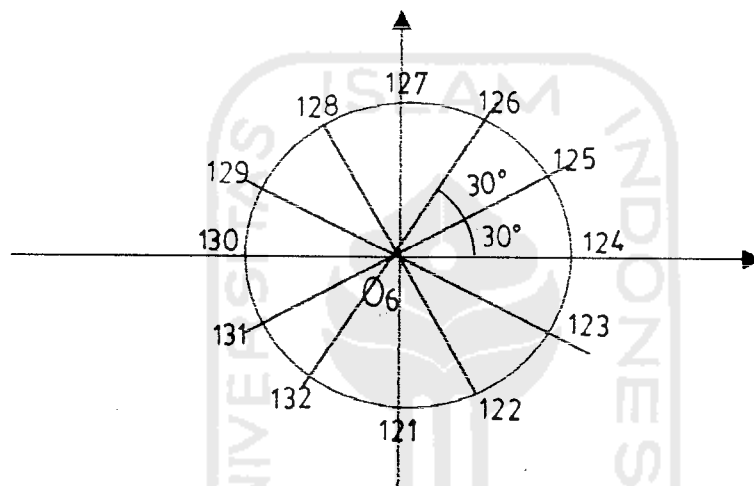
$$Y_n = 194,9760 \cos \{(n - 109) \cdot 15^\circ\}$$

$$n = 116 \text{ s/d } n = 120$$

$$X_n = -194,9760 \cos \{(n - 115) \cdot 15^\circ\} \rightarrow 15^\circ, 30^\circ, 45^\circ, 60^\circ, 75^\circ, 90^\circ$$

$$Y_n = -194,9760 \sin \{(n - 115) \cdot 15^\circ\}$$

6. Koordinat O_6 (0 ; 0 ; 463,0043)



Dari gambar tampak samping didapat :

$$473,6220 \cos (17,07066^\circ + 5 \cdot 12,15489^\circ) = 99,7236 \text{ inci}$$

$$n = 121 \text{ s/d } n = 132 \quad Z_n = 473,6220 \cdot \sin (17,07066 + 5 \cdot 12,15489) = 463,0043 \text{ inci}$$

$$n = 121 \text{ s/d } n = 124 \quad X_n = 99,7236 \sin \{(n - 121) \cdot 30^\circ\} \rightarrow 30^\circ, 60^\circ, 90^\circ$$

$$Y_n = -99,7236 \cos \{(n - 121) \cdot 30^\circ\}$$

$$n = 125 \text{ s/d } n = 127 \quad X_n = 99,7236 \cos \{(n - 124) \cdot 30^\circ\} \rightarrow 30^\circ, 60^\circ, 90^\circ$$

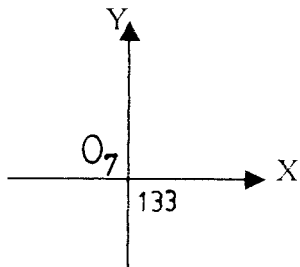
$$Y_n = 99,7236 \sin \{(n - 124) \cdot 30^\circ\}$$

$$n = 128 \text{ s/d } n = 130 \quad X_n = -99,7236 \sin \{(n - 127) \cdot 30^\circ\} \rightarrow 30^\circ, 60^\circ, 90^\circ$$

$$Y_n = 99,7236 \cos \{(n - 127) \cdot 30^\circ\}$$

$n = 131$ s/d $n = 132$

$$X_n = -99,7236 \cos \{(n - 130) \cdot 30^\circ\} \rightarrow 30^\circ, 60^\circ$$
$$Y_n = -99,7236 \sin \{(n - 130) \cdot 30^\circ\}$$



$$n = 133 \quad Z_n$$

$$X_n = 0$$

$$Y_n = 0$$

Persamaan-persamaan diatas digunakan untuk menghitung koordinat-koordinat joint pada gambar 4.1 dan setelah mendapatkan hasilnya, dapat dilihat pada tabel 4.1.



Tabel 4.1 : Koordinat joint (Sumbu Global)

Joint	X (in)	Y (in)	Z (in)
1	2	3	4
1	0,0000	-452,7559	139,0323
2	117,1819	-437,3286	139,0323
3	226,3780	-392,0981	139,0323
4	320,1468	-320,1468	139,0323
5	392,0981	-226,3780	139,0323
6	437,3286	-117,1819	139,0323
7	452,7559	0,0000	139,0323
8	437,3286	117,1819	139,0323
9	392,0981	226,1468	139,0323
10	320,1468	320,3780	139,0323
11	226,3780	392,0981	139,0323
12	117,1819	437,3286	139,0323
13	0,0000	452,7559	139,0323
14	-117,1819	437,3286	139,0323
15	-226,3780	392,0981	139,0323
16	-320,1468	320,1468	139,0323
17	-392,0981	226,3780	139,0323
18	-437,3286	117,1819	139,0323
19	-452,7559	0,0000	139,0323
20	-437,3286	-117,1819	139,0323
21	-392,0981	-226,1468	139,0323
22	-320,1468	-320,3780	139,0323
23	-226,3780	-392,0981	139,0323
24	-117,1819	-437,3286	139,0323
25	54,4162	-413,3322	231,2453
26	159,5402	-385,1643	231,2453
27	253,7919	-330,7481	231,2453
28	330,7481	-253,7919	231,2453
29	385,1643	-159,5402	231,2453
30	413,3322	-54,4162	231,2453
31	413,3322	54,4162	231,2453
32	385,1643	159,5402	231,2453
33	330,7481	253,7919	231,2453
34	253,7919	330,7481	231,2453
35	159,5402	385,1643	231,2453
36	54,4162	413,3322	231,2453
37	-54,4162	413,3322	231,2453

1	2	3	4
38	-159,5402	385,1643	231,2453
39	-253,7919	330,7481	231,2453
40	-330,7481	253,7919	231,2453
41	-385,1643	159,5402	231,2453
42	-413,3322	54,4162	231,2453
43	-413,3322	-54,4162	231,2453
44	-385,1643	-159,5402	231,2453
45	-330,7481	-253,7919	231,2453
46	-253,7919	-330,7481	231,2453
47	-159,5402	-385,1643	231,2453
48	-54,4162	-413,3322	231,2453
49	0,0000	-355,3760	313,0906
50	91,9781	-343,2668	313,0906
51	177,6880	-307,7646	313,0906
52	251,2888	-251,2888	313,0906
53	307,7646	-177,6880	313,0906
54	343,2668	-91,9781	313,0906
55	355,3760	0,0000	313,0906
56	343,2668	91,9781	313,0906
57	307,7646	177,6880	313,0906
58	251,2888	251,2888	313,0906
59	177,6880	307,7646	313,0906
60	91,9781	343,2668	313,0906
61	0,0000	355,3760	313,0906
62	-91,9781	343,2668	313,0906
63	-177,6880	307,7646	313,0906
64	-251,2888	251,2888	313,0906
65	-307,7646	177,6880	313,0906
66	-343,2668	91,9781	313,0906
67	-355,3760	0,0000	313,0906
68	-343,2668	-91,9781	313,0906
69	-307,7646	-177,6880	313,0906
70	-251,2888	-251,2888	313,0906
71	-177,6880	-307,7646	313,0906
72	-91,9781	-343,2668	313,0906
73	37,0584	-281,4864	380,8980
74	108,6497	-262,3036	380,8980
75	172,8367	-225,2453	380,8980
76	225,2452	-172,8367	380,8980
77	262,3036	-108,6497	380,8980

1	2	3	4
78	281,4864	-37,0584	380,8980
79	281,4864	37,0584	380,8980
80	262,3036	108,6497	380,8980
81	225,2452	172,8367	380,8980
82	172,8367	225,2453	380,8980
83	108,6497	262,3036	380,8980
84	37,0584	281,4864	380,8980
85	-37,0584	281,4864	380,8980
86	-108,6497	262,3036	380,8980
87	-172,8367	225,2453	380,8980
88	-225,2452	172,8367	380,8980
89	-262,3036	108,6497	380,8980
90	-281,4864	37,0584	380,8980
91	-281,4864	-37,0584	380,8980
92	-262,3036	-108,6497	380,8980
93	-225,2452	-172,8367	380,8980
94	-172,8367	-225,2453	380,8980
95	-108,6497	-262,3036	380,8980
96	-37,0584	-281,4864	380,8980
97	0,0000	-194,9760	431,6276
98	50,4635	-188,3323	431,6276
99	97,4880	-168,8542	431,6276
100	137,8688	-137,8688	431,6276
101	168,8542	-97,4880	431,6276
102	188,3323	-50,4635	431,6276
103	194,9760	0,0000	431,6276
104	188,3323	50,4635	431,6276
105	168,8542	97,4880	431,6276
106	137,8688	137,8688	431,6276
107	97,4880	168,8542	431,6276
108	50,4635	188,3323	431,6276
109	0,0000	194,9760	431,6276
110	-50,4635	188,3323	431,6276
111	-97,4880	168,8542	431,6276
112	-137,8688	137,8688	431,6276
113	-168,8542	97,4880	431,6276
114	-188,3323	50,4635	431,6276
115	-194,9760	0,0000	431,6276
116	-188,3323	-50,4635	431,6276
117	-168,8542	-97,4880	431,6276

1	2	3	4
118	-137,8688	-137,8688	431,6276
119	-97,4880	-168,8542	431,6276
120	-50,4635	-188,3323	431,6276
121	0,0000	-99,7236	463,0043
122	49,8618	-86,3632	463,0043
123	86,3632	-49,8618	463,0043
124	99,7236	0,0000	463,0043
125	86,3632	49,8618	463,0043
126	49,8618	86,3632	463,0043
127	0,0000	99,7236	463,0043
128	-49,8618	86,3632	463,0043
129	-86,3632	49,8618	463,0043
130	-99,7236	0,0000	463,0043
131	-86,3632	-49,8618	463,0043
132	-49,8618	-86,3632	463,0043
133	0,0000	0,0000	473,6220

Luas bidang segitiga dihitung berdasarkan panjang batang-batang yang membentuknya. Panjang batang dapat dicari dengan cara sebagai berikut :

1. Untuk batang horisontal

$$P = \sqrt{(X_{n+1} - X_n)^2 + (Y_{n+1} - Y_n)^2 + (Z_{n+1} - Z_n)^2}$$

2. Untuk batang diagonal

$$P = \sqrt{(X_{24+n} - X_n)^2 + (Y_{24+n} - Y_n)^2 + (Z_{24+n} - Z_n)^2}$$

$$P = \sqrt{(X_{23+n} - X_n)^2 + (Y_{23+n} - Y_n)^2 + (Z_{23+n} - Z_n)^2}$$

Pada prinsipnya untuk semua panjang batang dihitung dengan persamaan kuadrat dibawah ini kemudian hasilnya seperti pada tabel 4.2.

$$P = \sqrt{(X_j - X_i)^2 + (Y_j - Y_i)^2 + (Z_j - Z_i)^2}$$

dimana : i = koordinat joint awal

j = koordinat joint akhir

Tabel 4.2 : Panjang batang

Batang	Panjang (inci)
1 - 24	118,1931
25 - 48	108,8324
49 - 72	92,7718
73 - 96	74,1168
97 - 120	50,8990
121 - 132	51,6207
133 - 180	114,0990
181 - 228	114,0995
229 - 276	106,9151
277 - 324	106,9152
325 - 348	106,6891
349 - 354	100,2873
355 - 366	106,6891
367 - 372	100,2873

Luas bidang segitiga dicari dengan rumus segitiga = $\frac{1}{2}$. alas . tinggi. Untuk luas total sama dengan luas segitiga dikalikan dengan jumlah segitiga yang sebidang.

Tabel 4.3 : Luas bidang segitiga

Segitiga	Luas (inci ²)	Luas Total (inci ²)
1a	5767,9828	138431,5872
1b	5457,2320	130973,5680
2a	5457,2647	130974,3528
2b	4835,5028	116052,0672
3a	4468,2842	107238,8208
3b	3716,4832	89195,5968
4a	3716,4869	89195,6856
4b	2642,7295	63425,5080
5a	5273,6098	63283,3176
5b	2671,8874	32062,6488
6	5002,5156	30015,0936

4.3. Perhitungan Beban Mati

Beban-beban yang tergabung dalam beban mati adalah berat penutup , profil dan alat sambung.

1. Berat penutup

Berat penutup dihitung berdasarkan luas bidang-bidang segitiga yang menyusun kubah , sehingga setiap joint menerima sepertiga berat luasan segitiga tersebut. Luasan penutup yang lengkung dan terletak diatas rangka kubah ini diasumsikan sama dengan luas segitiga yang membentuk bidang kubah tersebut. Dengan berat jenis penutup yang berupa *fiber glass* adalah $1,8 \text{ t/m}^3$ yang dikalikan dengan luasan yang ditahan.

2. Berat profil

Berat profil termasuk berat sendiri sebesar 2,72 lb sesuai dengan AISC tabel 1.93.

3. Berat alat sambung

Berat alat sambung terdiri atas ball joint + eadcone + bolt = 8 kg bekerja pada tiap-tiap joint.

4. Berat total didapat dari berat akibat penutup + berat alat sambung.

Tabel 4.4 Perhitungan beban mati

Joint	Luas yang ditahan (in ²)	Berat akibat penutup (lb)	Berat alat sambung (lb)	Berat Profil (lb)	Berat total beban mati (lb)
1	2	3	4	5	6
1 - 24	5664,3992	5,5072E-03	0,1799	2,72	2,9054
25 - 48	10914,4099	0,0106	0,1799	2,72	2,9150
49 - 72	9467,6946	9,2049E-03	0,1799	2,72	2,9091



1	2	3	4	5	6
73 - 96	7576,2516	7,3660E-03	0,1799	2,72	2,9073
97	5116,4377	4,9744E-03	0,1799	2,72	2,9049
98	7764,9368	7,5494E-03	0,1799	2,72	2,9075
99	5116,4377	4,9744E-03	0,1799	2,72	2,9049
100	7764,9368	7,5494E-03	0,1799	2,72	2,9075
101	5116,4377	4,9744E-03	0,1799	2,72	2,9049
102	7764,9368	2,9049	0,1799	2,72	2,9075
103	5116,4377	2,9075	0,1799	2,72	2,9049
104	7764,9368	2,9049	0,1799	2,72	2,9075
105	5116,4377	2,9075	0,1799	2,72	2,9049
106	7764,9368	7,5494E-03	0,1799	2,72	2,9075
107	5116,4377	4,9744E-03	0,1799	2,72	2,9049
108	7764,9368	7,5494E-03	0,1799	2,72	2,9075
109	5116,4377	4,9744E-03	0,1799	2,72	2,9049
110	7764,9368	7,5494E-03	0,1799	2,72	2,9075
111	5116,4377	4,9744E-03	0,1799	2,72	2,9049
112	7764,9368	7,5494E-03	0,1799	2,72	2,9075
113	5116,4377	4,9744E-03	0,1799	2,72	2,9049
114	7764,9368	7,5494E-03	0,1799	2,72	2,9075
115	5116,4377	4,9744E-03	0,1799	2,72	2,9049
116	7764,9368	7,5494E-03	0,1799	2,72	2,9075
117	5116,4377	4,9744E-03	0,1799	2,72	2,9049
118	7764,9368	7,5494E-03	0,1799	2,72	2,9075
119	5116,4377	4,9744E-03	0,1799	2,72	2,9049
120	7764,9368	7,5494E-03	0,1799	2,72	2,9075
121	5206,6334	5,0621E-03	0,1799	2,72	2,9050
122	6874,1386	6,6833E-03	0,1799	2,72	2,9066
123	5206,6334	5,0621E-03	0,1799	2,72	2,9050
124	6874,1386	6,6833E-03	0,1799	2,72	2,9066
125	5206,6334	5,0621E-03	0,1799	2,72	2,9050
126	6874,1386	6,6833E-03	0,1799	2,72	2,9066
127	5206,6334	5,0621E-03	0,1799	2,72	2,9050
128	6874,1386	6,6833E-03	0,1799	2,72	2,9066
129	5206,6334	5,0621E-03	0,1799	2,72	2,9050
130	6874,1386	6,6833E-03	0,1799	2,72	2,9066
131	5206,6334	5,0621E-03	0,1799	2,72	2,9050
132	6874,1386	6,6833E-03	0,1799	2,72	2,9066
133	10005,0312	9,7273E-03	0,1799	2,72	2,9096
Total					119,1648

4.4. Perhitungan Beban Hidup

Beban hidup yang bekerja terdiri dari beban berguna yang berupa berat alat penerangan seberat 300 kg (300 kg = 6,7446 lb) dan bekerja pada titik puncak.

4.5. Beban Angin

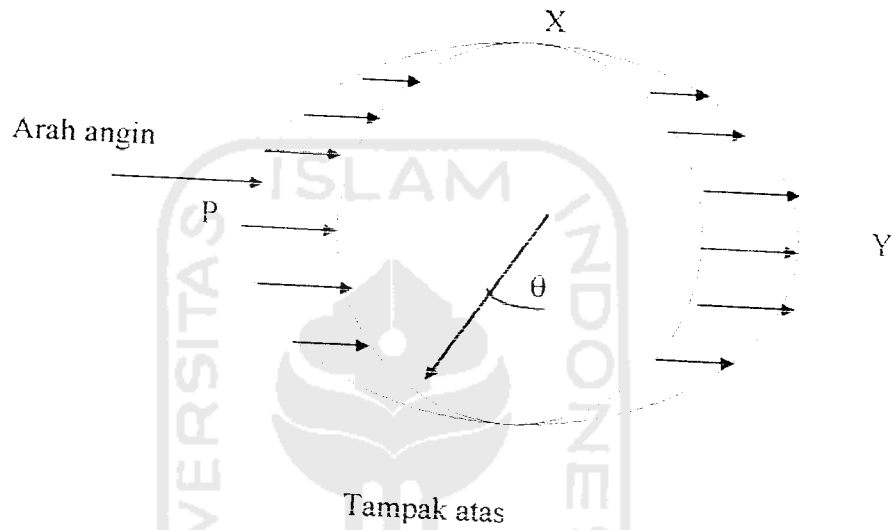
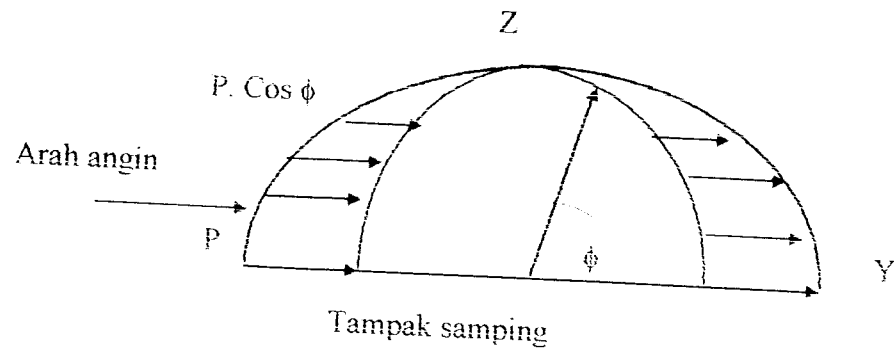
Struktur kubah didesain juga untuk menahan momen guling akibat gaya angin. Pada kenyataannya angin dapat terjadi dari arah mana saja. Gaya angin ini akan menghasilkan gaya angin tekan pada permukaan struktur yang terkena angin dan gaya angin isapan pada sisi sebaliknya. Gaya angin didistribusikan untuk setiap ketinggian struktur, selanjutnya didistribusikan lagi pada arah x, y dan z.

Berdasarkan Peraturan Pembebanan 1987 tekanan angin harus diambil minimum 25 kg/m² maka pada struktur kubah ini beban angin diambil sebesar 30 kg/m². Perhitungan beban angin dilakukan dengan cara mengalikan tekanan angin dengan luasan yang dikenai oleh angin dan menjadi beban titik (P). Gaya P ini kemudian didistribusikan pada tiap joint yang mengenai luasan itu dengan menggunakan rumus :

$$P_i = P \cdot \cos \phi \cdot \sin \theta$$

dimana : ϕ = sudut antara sumbu y dengan garis hubung antara joint dan titik pusat kubah

θ = sudut antara sumbu x dengan garis hubung antara joint dan titik pusat kubah.



Gambar 4.2 Pemodelan beban angin

Tabel 4.5 Beban angin

Joint	Luas yang ditahan (inci ²)	θ	ϕ	$\sin \theta$	$\cos \phi$	P (lb)
1	2	3	4	5	6	7
1	5664,3992	360	17,07	0,000	0,956	0,0000
2	5664,3992	345	17,07	-0,259	0,956	-946,0051
3	5664,3992	330	17,07	-0,500	0,956	-1138,5499
4	5664,3992	315	17,07	-0,707	0,956	-1609,9096
5	5664,3992	300	17,07	-0,866	0,956	-1971,9684
6	5664,3992	285	17,07	-0,966	0,956	-2199,6784
7	5664,3992	270	17,07	-1,000	0,956	-2277,0998

1	2	3	4	5	6	7
8	5664,3992	255	17,07	-0,966	0,956	-2199,6784
9	5664,3992	240	17,07	-0,866	0,956	-1971,9684
10	5664,3992	225	17,07	-0,707	0,956	-1609,9096
11	5664,3992	210	17,07	-0,500	0,956	-1138,5499
12	5664,3992	195	17,07	-0,259	0,956	-946,0051
13	5664,3992	180	17,07	0,000	0,956	0,0000
14	5664,3992	165	17,07	0,259	0,956	946,0051
15	5664,3992	150	17,07	0,500	0,956	1138,5499
16	5664,3992	135	17,07	0,707	0,956	1609,9096
17	5664,3992	120	17,07	0,866	0,956	1971,9684
18	5664,3992	105	17,07	0,966	0,956	2199,6784
19	5664,3992	90	17,07	1,000	0,956	2277,0998
20	5664,3992	75	17,07	0,966	0,956	2199,6784
21	5664,3992	60	17,07	0,866	0,956	1971,9684
22	5664,3992	45	17,07	0,707	0,956	1609,9096
23	5664,3992	30	17,07	0,500	0,956	1138,5499
24	5664,3992	15	17,07	0,259	0,956	946,0051
25	10914,6946	352,5	29,225	-0,131	0,873	-841,9140
26	10914,6946	337,5	29,225	-0,383	0,873	-2461,4739
27	10914,6946	322,5	29,225	-0,609	0,873	-3913,9363
28	10914,6946	307,5	29,225	-0,793	0,873	-5096,4720
29	10914,6946	292,5	29,225	-0,924	0,873	-5938,3861
30	10914,6946	277,5	29,225	-0,991	0,873	-6368,9833
31	10914,6946	262,5	29,225	-0,991	0,873	-6368,9833
32	10914,6946	247,5	29,225	-0,924	0,873	-5938,3861
33	10914,6946	232,5	29,225	-0,793	0,873	-5096,4720
34	10914,6946	217,5	29,225	-0,609	0,873	-3913,9363
35	10914,6946	202,5	29,225	-0,383	0,873	-2461,4739
36	10914,6946	187,5	29,225	-0,131	0,873	-841,9140
37	10914,6946	172,5	29,225	0,131	0,873	841,9140
38	10914,6946	157,5	29,225	0,383	0,873	2461,4739
39	10914,6946	142,5	29,225	0,609	0,873	3913,9363
40	10914,6946	127,5	29,225	0,793	0,873	5096,4720
41	10914,6946	112,5	29,225	0,924	0,873	5938,3861
42	10914,6946	97,5	29,225	0,991	0,873	6368,9833
43	10914,6946	82,5	29,225	0,991	0,873	6368,9833
44	10914,6946	67,5	29,225	0,924	0,873	5938,3861
45	10914,6946	52,5	29,225	0,793	0,873	5096,4720
46	10914,6946	37,5	29,225	0,609	0,873	3913,9363
47	10914,6946	22,5	29,225	0,383	0,873	2461,4739

1	2	3	4	5	6	7
48	10914,6946	7,5	29,225	0,131	0,873	841,9140
49	9467,6946	360	41,38	0,000	0,750	0,0000
50	9467,6946	345	41,38	-0,259	0,750	-1240,4727
51	9467,6946	330	41,38	-0,500	0,750	-2394,7350
52	9467,6946	315	41,38	-0,707	0,750	-3386,1553
53	9467,6946	300	41,38	-0,866	0,750	-4147,6810
54	9467,6946	285	41,38	-0,966	0,750	-4626,6280
55	9467,6946	270	41,38	-1,000	0,750	-4789,4700
56	9467,6946	255	41,38	-0,966	0,750	-4626,6280
57	9467,6946	240	41,38	-0,866	0,750	-4147,6810
58	9467,6946	225	41,38	-0,707	0,750	-3386,1553
59	9467,6946	210	41,38	-0,500	0,750	-2394,7350
60	9467,6946	195	41,38	-0,259	0,750	-1240,4727
61	9467,6946	180	41,38	0,000	0,750	0,0000
62	9467,6946	165	41,38	0,259	0,750	1240,4727
63	9467,6946	150	41,38	0,500	0,750	2394,7350
64	9467,6946	135	41,38	0,707	0,750	3386,1553
65	9467,6946	120	41,38	0,866	0,750	4147,6810
66	9467,6946	105	41,38	0,966	0,750	4626,6280
67	9467,6946	90	41,38	1,000	0,750	4789,4700
68	9467,6946	75	41,38	0,966	0,750	4626,6280
69	9467,6946	60	41,38	0,866	0,750	4147,6810
70	9467,6946	45	41,38	0,707	0,750	3386,1553
71	9467,6946	30	41,38	0,500	0,750	2394,7350
72	9467,6946	15	41,38	0,259	0,750	1240,4727
73	7576,2516	352,5	53,535	-0,131	0,594	-397,6437
74	7576,2516	337,5	53,535	-0,383	0,594	-1162,5766
75	7576,2516	322,5	53,535	-0,609	0,594	-1848,5878
76	7576,2516	307,5	53,535	-0,793	0,594	-2407,1102
77	7576,2516	292,5	53,535	-0,924	0,594	-2804,7539
78	7576,2516	277,5	53,535	-0,991	0,594	-3008,1289
79	7576,2516	262,5	53,535	-0,991	0,594	-3008,1289
80	7576,2516	247,5	53,535	-0,924	0,594	-2804,7539
81	7576,2516	232,5	53,535	-0,793	0,594	-2407,1102
82	7576,2516	217,5	53,535	-0,609	0,594	-1848,5878
83	7576,2516	202,5	53,535	-0,383	0,594	-1162,5766
84	7576,2516	187,5	53,535	-0,131	0,594	-397,6437
85	7576,2516	172,5	53,535	0,131	0,594	397,6437
86	7576,2516	157,5	53,535	0,383	0,594	1162,5766
87	7576,2516	142,5	53,535	0,609	0,594	1848,5878

1	2	3	4	5	6	7
88	7576,2516	127,5	53,535	0,793	0,594	2407,1102
89	7576,2516	112,5	53,535	0,924	0,594	2804,7539
90	7576,2516	97,5	53,535	0,991	0,594	3008,1289
91	7576,2516	82,5	53,535	0,991	0,594	3008,1289
92	7576,2516	67,5	53,535	0,924	0,594	2804,7539
93	7576,2516	52,5	53,535	0,793	0,594	2407,1102
94	7576,2516	37,5	53,535	0,609	0,594	1848,5878
95	7576,2516	22,5	53,535	0,383	0,594	1162,5766
96	7576,2516	7,5	53,535	0,131	0,594	397,6437
97	5116,4377	360	65,69	0,000	0,412	0,0000
98	7764,9368	345	65,69	-0,259	0,412	-558,8778
99	5116,4377	330	65,69	-0,500	0,412	-710,9137
100	7764,9368	315	65,69	-0,707	0,412	-1525,5853
101	5116,4377	300	65,69	-0,866	0,412	-1005,2319
102	7764,9368	285	65,69	-0,966	0,412	-2084,4632
103	5116,4377	270	65,69	-1,000	0,412	-1421,8273
104	7764,9368	255	65,69	-0,966	0,412	-2084,4632
105	5116,4377	240	65,69	-0,866	0,412	-1005,2319
106	7764,9368	225	65,69	-0,707	0,412	-1525,5853
107	5116,4377	210	65,69	-0,500	0,412	-710,91137
108	7764,9368	195	65,69	-0,259	0,412	-558,8778
109	5116,4377	180	65,69	0,000	0,412	0,0000
110	7764,9368	165	65,69	0,259	0,412	558,8778
111	5116,4377	150	65,69	0,500	0,412	710,9137
112	7764,9368	135	65,69	0,707	0,412	1525,5853
113	5116,4377	120	65,69	0,866	0,412	1005,2319
114	7764,9368	105	65,69	0,966	0,412	2084,4632
115	5116,4377	90	65,69	1,000	0,412	1421,8273
116	7764,9368	75	65,69	0,966	0,412	2084,4632
117	5116,4377	60	65,69	0,866	0,412	1005,2319
118	7764,9368	45	65,69	0,707	0,412	1525,5853
119	5116,4377	30	65,69	0,500	0,412	710,91137
120	7764,9368	15	65,69	0,259	0,412	558,8778
121	5206,6334	360	77,845	0,000	0,211	0,0000
122	6874,1386	330	77,845	-0,500	0,211	-489,1620
123	5206,6334	300	77,845	-0,866	0,211	-641,7107
124	6874,1386	270	77,845	-1,000	0,211	-978,3240
125	5206,6334	240	77,845	-0,866	0,211	-641,7107
126	6874,1386	210	77,845	-0,500	0,211	-489,1620
127	5206,6334	180	77,845	0,000	0,211	0,0000

1	2	3	4	5	6	7
128	6874,1386	150	77,845	0,500	0,211	489,1620
129	5206,6334	120	77,845	0,866	0,211	641,7107
130	6874,1386	90	77,845	1,000	0,211	978,3240
131	5206,6334	60	77,845	0,866	0,211	641,7107
132	6874,1386	30	77,845	0,500	0,211	489,1620
133	10005,0312	0	90	0,000	0,000	0,0000

Untuk mencari beban angin terdistribusi dengan cara sebagai berikut :

$$P_x = \frac{\text{koordinat } X_n}{R} \times P \quad \text{dimana: } R = \text{jari} \cdot \text{jari besar} = 473,6220 \text{ inci}$$

$$P_y = \frac{\text{koordinat } Y_n}{R} \times P$$

$$P_z = \frac{\text{koordinat } Z_n}{R} \times P$$

Tabel 4.6 Tabel distribusi beban angin

Joint	P (lb)	Px (lb)	Py (lb)	Pz (lb)
1	2	3	4	5
1	0,0000	0,0000	0,0000	0,0000
2	-946,0051	234,0573	-873,5133	277,7010
3	-1138,5499	544,1948	-942,5729	334,2227
4	-1609,9096	1088,252	-1088,2252	472,5909
5	-1971,9684	1632,5362	-942,5455	578,8737
6	-2199,6784	2031,1182	-544,2367	645,7182
7	-2277,0998	2176,7789	0,0000	668,4454
8	-2199,6784	2031,1182	544,2367	645,7182
9	-1971,9684	1632,53622	942,5455	578,8737
10	-1609,9096	1088,2252	1088,2252	472,5909
11	-1138,5499	544,1948	942,5729	334,2227
12	-946,0051	234,0573	873,5133	277,7010
13	0,0000	0,0000	0,0000	0,0000
14	946,0051	-234,0573	873,5133	277,7010
15	1138,5499	-544,1948	942,5729	334,2227
16	1609,9096	-1088,252	1088,2252	472,5909

1	2	3	4	5
17	1971,9684	-1632,5362	942,5455	578,8737
18	2199,6784	-2031,1182	544,2367	645,7182
19	2277,0998	-2176,7789	0,0000	668,4454
20	2199,6784	-2031,1182	-544,2367	645,7182
21	1971,9684	-1632,5362	-942,5455	578,8737
22	1609,9096	-1088,2252	-1088,2252	472,5909
23	1138,5499	-544,1948	-942,5729	334,2227
24	946,0051	-234,0573	-873,5133	277,7010
25	-841,9140	96,7306	-734,7424	411,0634
26	-2461,4739	829,1508	-2001,7480	1201,8113
27	-3913,9363	2097,2956	-2733,2493	1910,9741
28	-5096,4720	3559,0586	-2730,9612	2488,3456
29	-5938,3861	4829,2823	-2000,3533	2899,4090
30	-6368,9833	5558,2424	-731,7563	3109,6475
31	-6368,9833	5558,2424	731,7563	3109,6475
32	-5938,3861	4829,2823	2000,3533	2899,4090
33	-5096,4720	3559,0586	2730,9612	2488,3456
34	-3913,9363	2097,2956	2733,2493	1910,9741
35	-2461,4739	829,1508	2001,7480	1201,8113
36	-841,9140	96,7306	734,7424	411,06344
37	841,9140	-96,7306	734,7424	411,0634
38	2461,4739	-829,1508	2001,7480	1201,8113
39	3913,9363	-2097,2956	2733,2493	1910,9741
40	5096,4720	-3559,0586	2730,9612	2488,3456
41	5938,3861	-4829,2823	2000,3533	2899,4090
42	6368,9833	-5558,2424	731,7563	3109,6475
43	6368,9833	-5558,2424	-731,7563	3109,6475
44	5938,3861	-4829,2823	-2000,3533	2899,4090
45	5096,4720	-3559,0586	-2730,9612	2488,3456
46	3913,9363	-2097,2956	-2733,2493	1910,9741
47	2461,4739	-829,1508	-2001,7480	1201,8113
48	841,9140	-96,7306	-734,7424	411,06344
49	0,0000	0,0000	0,0000	0,0000
50	-1240,4727	240,9017	-899,0568	820,0218
51	-2394,7350	898,4289	-1556,1242	1583,0536
52	-3386,1553	1796,5865	-1796,5865	2238,4378
53	-4147,6810	2695,2071	-1556,1242	2741,8488
54	-4626,6280	3353,2391	-899,0568	3058,4596
55	-4789,4700	3593,2391	0,0000	3166,1072
56	-4626,6280	3353,2391	899,0568	3058,4596

1	2	3	4	5
57	-4147,6810	2695,2071	1556,1242	2741,8488
58	-3386,1553	1796,5865	1796,5865	2238,4378
59	-2394,7350	898,4289	1556,1242	1583,0536
60	-1240,4727	240,9017	899,0568	820,0218
61	0,0000	0,0000	0,0000	0,0000
62	1240,4727	-240,9017	899,0568	820,0218
63	2394,7350	-898,4289	1556,1242	1583,0536
64	3386,1553	-1796,5865	1796,5865	2238,4378
65	4147,6810	-2695,2071	1556,1242	2741,8488
66	4626,6280	-3353,2391	899,0568	3058,4596
67	4789,4700	-3593,2391	0,0000	3166,1072
68	4626,6280	-3353,2391	-899,0568	3058,4596
69	4147,6810	-2695,2071	-1556,1242	2741,8488
70	3386,1553	-1796,5865	-1796,5865	2238,4378
71	2394,7350	-898,4289	-1556,1242	1583,0536
72	1240,4727	-240,9017	-899,0568	820,0218
73	-397,6437	31,1135	-236,3304	319,7945
74	-1162,5766	266,6971	-643,8637	934,9716
75	-1848,5878	674,5966	-879,1520	1486,6780
76	-2407,1102	1144,7737	-878,4157	1935,8549
77	-2804,7539	1553,3422	-643,4154	2255,6493
78	-3008,1289	1787,8126	-235,3701	2419,2083
79	-3008,1289	1787,8126	235,3701	2419,2083
80	-2804,7539	1553,3422	643,4154	2255,6493
81	-2407,1102	1144,7737	878,4157	1935,8549
82	-1848,5878	674,5966	879,1520	1486,6780
83	-1162,5766	266,6971	643,8637	934,9716
84	-397,6437	31,1135	236,3304	319,7945
85	397,6437	-31,1135	236,3304	319,7945
86	1162,5766	-266,6971	643,8637	934,9716
87	1848,5878	-674,5966	879,1520	1486,6780
88	2407,1102	-1144,7737	878,4157	1935,8549
89	2804,7539	-1553,3422	643,4154	2255,6493
90	3008,1289	-1787,8126	235,3701	2419,2083
91	3008,1289	-1787,8126	-235,3701	2419,2083
92	2804,7539	-1553,3422	-643,4154	2255,6493
93	2407,1102	-1144,7737	-878,4157	1935,8549
94	1848,5878	-674,5966	-879,1520	1486,6780
95	1162,5766	-266,6971	-643,8637	934,9716
96	397,6437	-31,1135	-236,3304	319,7945

1	2	3	4	5
97	0,0000	0,0000	0,0000	0,0000
98	-558,8778	59,5473	-828,8714	509,3241
99	-710,9137	146,3309	-358,3821	647,8795
100	-1525,5853	444,0896	-444,0896	1390,3170
101	-1005,2319	358,3821	-146,3309	916,1015
102	-2084,4632	828,8714	-59,5473	1899,6412
103	-1421,8273	585,3237	0,0000	1295,7589
104	-2084,4632	828,8714	59,5473	1899,6412
105	-1005,2319	358,3821	146,3309	916,1015
106	-1525,5853	444,0896	444,0896	1390,3170
107	-710,91137	146,3309	358,3821	647,8795
108	-558,8778	59,5473	828,8714	509,3241
109	0,0000	0,0000	0,0000	0,0000
110	558,8778	-59,5473	828,8714	509,3241
111	710,9137	-146,3309	358,3821	647,8795
112	1525,5853	-444,0896	444,0896	1390,3170
113	1005,2319	-358,3821	146,3309	916,1015
114	2084,4632	-828,8714	59,5473	1899,6412
115	1421,8273	-585,3237	0,0000	1295,7589
116	2084,4632	-828,8714	-59,5473	1899,6412
117	1005,2319	-358,3821	-146,3309	916,1015
118	1525,5853	-444,0896	-444,0896	1390,3170
119	710,91137	-146,3309	-358,3821	647,8795
120	558,8778	-59,5473	-828,8714	509,3241
121	0,0000	0,0000	0,0000	0,0000
122	-489,1620	51,4978	-117,0135	478,1959
123	-641,7107	117,0135	-51,4978	672,3248
124	-978,3240	205,9913	0,0000	956,3918
125	-641,7107	117,0135	51,4978	627,3248
126	-489,1620	51,4978	117,0135	478,1959
127	0,0000	0,0000	0,0000	0,0000
128	489,1620	-51,4978	117,0135	478,1959
129	641,7107	-117,0135	51,4978	672,3248
130	978,3240	-205,9913	0,0000	956,3918
131	641,7107	-117,0135	-51,4978	627,3248
132	489,1620	-51,4978	-117,0135	478,1959
133	0,0000	0,0000	0,0000	0,0000

4.6 Pengecekan Elemen Struktur

Gaya batang diambil dari gaya batang akibat beban tetap , bila gaya batang beban tetap + beban sementara $\geq 125 \%$ beban tetap , maka yang diambil adalah gaya batang akibat beban tetap + beban sementara , dan angka keamanan ditingkatkan menjadi 1,25.

Hasil pengecekan elemen struktur dengan rumus-rumus AISC dapat dilihat pada tabel 4.7 dan tabel 4.8.

Keterangan :

- L = panjang batang
- Pmax = gaya aksial maksimum yang terjadi pada batang , dengan tanda positif (+) untuk batang tarik dan negatif (-) untuk batang desak , diambil dari beban tetap atau beban sementara bila $> 1,25$ beban tetap.
- Mx max = momen maksimum arah x
- My max = momen maksimum arah y
- fa = tegangan akibat beban aksial yang terjadi
- Fa = tegangan ijin desak aksial
- BT = beban tetap = beban mati + beban hidup
- BS = beban sementara = beban mati + beban hidup + beban angin

Tabel 4.7 : Perhitungan Gaya Batang

Tabel 4.8 : Perhitungan Baut dan Ball Joint

Tabel 4.7 : Perhitungan Gaya Batang

Btg	Panjang (in)	Pmax (Kips)		Profil (in)	ft (ksi)	fa (ksi)	Ft (ksi)	Fa (ksi)	Ket.
		BT	BT + BS						
1	2	3	4	6	7	8	9	10	11
1	118,1931	0	0	1,5	0	0	0	0	Aman
2	118,1931	0	0	1,5	0	0	0	0	Aman
3	118,1931	0	0	1,5	0	0	0	0	Aman
4	118,1931	0	0	1,5	0	0	0	0	Aman
5	118,1931	0	0	1,5	0	0	0	0	Aman
6	118,1931	0	0	1,5	0	0	0	0	Aman
7	118,1931	0	0	1,5	0	0	0	0	Aman
8	118,1931	0	0	1,5	0	0	0	0	Aman
9	118,1931	0	0	1,5	0	0	0	0	Aman
10	118,1931	0	0	1,5	0	0	0	0	Aman
11	118,1931	0	0	1,5	0	0	0	0	Aman
12	118,1931	0	0	1,5	0	0	0	0	Aman
13	118,1931	0	0	1,5	0	0	0	0	Aman
14	118,1931	0	0	1,5	0	0	0	0	Aman
15	118,1931	0	0	1,5	0	0	0	0	Aman
16	118,1931	0	0	1,5	0	0	0	0	Aman
17	118,1931	0	0	1,5	0	0	0	0	Aman
18	118,1931	0	0	1,5	0	0	0	0	Aman
19	118,1931	0	0	1,5	0	0	0	0	Aman
20	118,1931	0	0	1,5	0	0	0	0	Aman
21	118,1931	0	0	1,5	0	0	0	0	Aman
22	118,1931	0	0	1,5	0	0	0	0	Aman
23	118,1931	0	0	1,5	0	0	0	0	Aman
24	118,1931	0	0	1,5	0	0	0	0	Aman
25	108,8324	0,06114	0,07253	1,5	0,09078	-	21,6	0	Aman
26	108,8324	0,06114	0,07207	1,5	0,09020	-	21,6	-	Aman
27	108,8324	0,06114	0,07547	1,5	0,09446	-	21,6	-	Aman
28	108,8324	0,06114	0,08320	1,5	0,10413	-	21,6	-	Aman
29	108,8324	0,06114	0,08232	1,5	0,10303	-	21,6	-	Aman
30	108,8324	0,06114	0,08461	1,5	0,10590	-	21,6	-	Aman
31	108,8324	0,06114	0,08587	1,5	0,10747	-	21,6	-	Aman
32	108,8324	0,06114	0,08539	1,5	0,10687	-	21,6	-	Aman

1	2	3	4	5	6	7	8	9	10	11
33	108.8324	0.06114	0.08325	0.08325	1.5	0.10420	-	21.6	-	Aman
34	108.8324	0.06114	0.07988	0.07988	1.5	0.09998	-	21.6	-	Aman
35	108.8324	0.06114	0.07608	0.07608	1.5	0.09522	-	21.6	-	Aman
36	108.8324	0.06114	0.07316	0.07316	1.5	0.09157	-	21.6	-	Aman
37	108.8324	0.06114	0.07350	0.07350	1.5	0.09199	-	21.6	-	Aman
38	108.8324	0.06114	0.07318	0.07318	1.5	0.09159	-	21.6	-	Aman
39	108.8324	0.06114	0.07611	0.07611	1.5	0.09526	-	21.6	-	Aman
40	108.8324	0.06114	0.01995	0.01995	1.5	0.10007	-	21.6	-	Aman
41	108.8324	0.06114	0.08338	0.08338	1.5	0.10436	-	21.6	-	Aman
42	108.8324	0.06114	0.08566	0.08566	1.5	0.10721	-	21.6	-	Aman
43	108.8324	0.06114	0.08641	0.08641	1.5	0.10815	-	21.6	-	Aman
44	108.8324	0.06114	0.08552	0.08552	1.5	0.10704	-	21.6	-	Aman
45	108.8324	0.06114	0.08309	0.08309	1.5	0.10399	-	21.6	-	Aman
46	108.8324	0.06114	0.07950	0.07950	1.5	0.09950	-	21.6	-	Aman
47	108.8324	0.06114	0.07550	0.07550	1.5	0.09450	-	21.6	-	Aman
48	108.8324	0.06114	0.07240	0.07240	1.5	0.09062	-	21.6	-	Aman
49	92.7718	0.04398	0.05604	0.05604	1.5	0.07012	-	21.6	-	Aman
50	92.7718	0.04398	0.05855	0.05855	1.5	0.07328	-	21.6	-	Aman
51	92.7718	0.04398	0.05880	0.05880	1.5	0.07359	-	21.6	-	Aman
52	92.7718	0.04398	0.05957	0.05957	1.5	0.07456	-	21.6	-	Aman
53	92.7718	0.04398	0.06969	0.06969	1.5	0.08722	-	21.6	-	Aman
54	92.7718	0.04398	0.07300	0.07300	1.5	0.09144	-	21.6	-	Aman
55	92.7718	0.04398	0.07354	0.07354	1.5	0.09204	-	21.6	-	Aman
56	92.7718	0.04398	0.07210	0.07210	1.5	0.09024	-	21.6	-	Aman
57	92.7718	0.04398	0.06895	0.06895	1.5	0.08630	-	21.6	-	Aman
58	92.7718	0.04398	0.06467	0.06467	1.5	0.08094	-	21.6	-	Aman
59	92.7718	0.04398	0.06020	0.06020	1.5	0.07534	-	21.6	-	Aman
60	92.7718	0.04398	0.05687	0.05687	1.5	0.07118	-	21.6	-	Aman
61	92.7718	0.04398	0.05688	0.05688	1.5	0.07119	-	21.6	-	Aman
62	92.7718	0.04398	0.06024	0.06024	1.5	0.07540	-	21.6	-	Aman
63	92.7718	0.04398	0.06474	0.06474	1.5	0.08103	-	21.6	-	Aman
64	92.7718	0.04398	0.06908	0.06908	1.5	0.08646	-	21.6	-	Aman
65	92.7718	0.04398	0.07232	0.07232	1.5	0.09052	-	21.6	-	Aman
66	92.7718	0.04398	0.07401	0.07401	1.5	0.09263	-	21.6	-	Aman
67	92.7718	0.04398	0.07395	0.07395	1.5	0.09255	-	21.6	-	Aman
68	92.7718	0.04398	0.07220	0.07220	1.5	0.09036	-	21.6	-	Aman
69	92.7718	0.04398	0.06882	0.06882	1.5	0.08614	-	21.6	-	Aman
70	92.7718	0.04398	0.06437	0.06437	1.5	0.08056	-	21.6	-	Aman
71	92.7718	0.04398	0.05976	0.05976	1.5	0.07480	-	21.6	-	Aman

1	2	3	4	5	6	7	8	9	10	11
72	92.7718	0.04398	0.05626	0.05626	1.5	0.07042	-	21.6	-	Aman
73	74.1168	0.08604	0.10453	0.10453	1.5	0.13083	-	21.6	-	Aman
74	74.1168	0.08546	0.10059	0.10059	1.5	0.12590	-	21.6	-	Aman
75	74.1168	0.08604	0.10082	0.10082	1.5	0.12620	-	21.6	-	Aman
76	74.1168	0.08546	0.10428	0.10428	1.5	0.13052	-	21.6	-	Aman
77	74.1168	0.08604	0.09968	0.09968	1.5	0.12476	-	21.6	-	Aman
78	74.1168	0.08546	0.09758	0.09758	1.5	0.12213	-	21.6	-	Aman
79	74.1168	0.08604	0.09941	0.09941	1.5	0.12442	-	21.6	-	Aman
80	74.1168	0.08546	0.09827	0.09827	1.5	0.12300	-	21.6	-	Aman
81	74.1168	0.08604	0.10044	0.10044	1.5	0.12571	-	21.6	-	Aman
82	74.1168	0.08546	0.09898	0.09898	1.5	0.12388	-	21.6	-	Aman
83	74.1168	0.08604	0.10071	0.10071	1.5	0.12605	-	21.6	-	Aman
84	74.1168	0.08546	0.10132	0.10132	1.5	0.12681	-	21.6	-	Aman
85	74.1168	0.08604	0.10533	0.10533	1.5	0.13183	-	21.6	-	Aman
86	74.1168	0.08546	0.10138	0.10138	1.5	0.12688	-	21.6	-	Aman
87	74.1168	0.08604	0.10085	0.10085	1.5	0.12622	-	21.6	-	Aman
88	74.1168	0.08546	0.09922	0.09922	1.5	0.12418	-	21.6	-	Aman
89	74.1168	0.08604	0.10084	0.10084	1.5	0.12621	-	21.6	-	Aman
90	74.1168	0.08546	0.09904	0.09904	1.5	0.12446	-	21.6	-	Aman
91	74.1168	0.08604	0.10037	0.10037	1.5	0.12562	-	21.6	-	Aman
92	74.1168	0.08546	0.09875	0.09875	1.5	0.12360	-	21.6	-	Aman
93	74.1168	0.08604	0.10053	0.10053	1.5	0.12582	-	21.6	-	Aman
94	74.1168	0.08546	0.09876	0.09876	1.5	0.12361	-	21.6	-	Aman
95	74.1168	0.08604	0.10025	0.10025	1.5	0.12547	-	21.6	-	Aman
96	74.1168	0.08546	0.10066	0.10066	1.5	0.12598	-	21.6	-	Aman
97	50.8990	0.13818	0.15797	0.15797	1.5	0.19771	-	21.6	-	Aman
98	50.8990	0.13818	0.15807	0.15807	1.5	0.19784	-	21.6	-	Aman
99	50.8990	0.13818	0.15440	0.15440	1.5	0.19324	-	21.6	-	Aman
100	50.8990	0.13818	0.15437	0.15437	1.5	0.19321	-	21.6	-	Aman
101	50.8990	0.13818	0.15018	0.15018	1.5	0.18796	-	21.6	-	Aman
102	50.8990	0.13818	0.15063	0.15063	1.5	0.18853	-	21.6	-	Aman
103	50.8990	0.13818	0.15055	0.15055	1.5	0.18843	-	21.6	-	Aman
104	50.8990	0.13818	0.15004	0.15004	1.5	0.18779	-	21.6	-	Aman
105	50.8990	0.13818	0.15327	0.15327	1.5	0.19183	-	21.6	-	Aman
106	50.8990	0.13818	0.15319	0.15319	1.5	0.19173	-	21.6	-	Aman
107	50.8990	0.13818	0.15785	0.15785	1.5	0.19756	-	21.6	-	Aman
108	50.8990	0.13818	0.15813	0.15813	1.5	0.19791	-	21.6	-	Aman
109	50.8990	0.13818	0.15822	0.15822	1.5	0.19803	-	21.6	-	Aman
110	50.8990	0.13818	0.15796	0.15796	1.5	0.19770	-	21.6	-	Aman

1	2	3	4	5	6	7	8	9	10	11
111	50.8990	0.13818	0.15347	0.15347	1.5	0.19208	-	21.6	-	Aman
112	50.8990	0.13818	0.15361	0.15361	1.5	0.19225	-	21.6	-	Aman
113	50.8990	0.13818	0.15047	0.15047	1.5	0.18833	-	21.6	-	Aman
114	50.8990	0.13818	0.15117	0.15117	1.5	0.18920	-	21.6	-	Aman
115	50.8990	0.13818	0.15104	0.15104	1.5	0.18904	-	21.6	-	Aman
116	50.8990	0.13818	0.15034	0.15034	1.5	0.18816	-	21.6	-	Aman
117	50.8990	0.13818	0.15322	0.15322	1.5	0.19177	-	21.6	-	Aman
118	50.8990	0.13818	0.15298	0.15298	1.5	0.19147	-	21.6	-	Aman
119	50.8990	0.13818	0.15744	0.15744	1.5	0.19705	-	21.6	-	Aman
120	50.8990	0.13818	0.15766	0.15766	1.5	0.19732	-	21.6	-	Aman
121	51.6207	0.68778	0.70431	0.70431	1.5	0.88149	-	21.6	-	Aman
122	51.6207	0.68778	0.69454	0.69454	1.5	0.86926	-	21.6	-	Aman
123	51.6207	0.68778	0.68506	0.68778	1.5	0.86080	-	21.6	-	Aman
124	51.6207	0.68778	0.68475	0.68778	1.5	0.86080	-	21.6	-	Aman
125	51.6207	0.68778	0.69378	0.69378	1.5	0.86831	-	21.6	-	Aman
126	51.6207	0.68778	0.70710	0.70710	1.5	0.88498	-	21.6	-	Aman
127	51.6207	0.68778	0.70428	0.70428	1.5	0.88145	-	21.6	-	Aman
128	51.6207	0.68778	0.69423	0.69423	1.5	0.86887	-	21.6	-	Aman
129	51.6207	0.68778	0.68519	0.68778	1.5	0.86080	-	21.6	-	Aman
130	51.6207	0.68778	0.68498	0.68778	1.5	0.86080	-	21.6	-	Aman
131	51.6207	0.68778	0.69371	0.69371	1.5	0.86080	-	21.6	-	Aman
132	51.6207	0.68778	0.70386	0.70386	1.5	0.86822	-	21.6	-	Aman
133	114.0990	-0.02556	-0.02351	-0.02556	1.5	0.88093	-	21.6	-	Aman
134	114.0990	-0.02556	-0.02919	-0.02919	1.5	-	0.03199	-	4.5288	Aman
135	114.0990	-0.02556	-0.01382	-0.02556	1.5	-	0.03653	-	4.5288	Aman
136	114.0990	-0.02556	-0.02730	-0.02730	1.5	-	0.03199	-	4.5288	Aman
137	114.0990	-0.02556	-0.00902	-0.02556	1.5	-	0.03417	-	4.5288	Aman
138	114.0990	-0.02556	-0.02483	-0.02556	1.5	-	0.03199	-	4.5288	Aman
139	114.0990	-0.02556	-0.00499	-0.02556	1.5	-	0.03199	-	4.5288	Aman
140	114.0990	-0.02556	-0.02213	-0.02556	1.5	-	0.03199	-	4.5288	Aman
141	114.0990	-0.02556	-0.00463	-0.02556	1.5	-	0.03199	-	4.5288	Aman
142	114.0990	-0.02556	-0.01643	-0.02556	1.5	-	0.03199	-	4.5288	Aman
143	114.0990	-0.02556	-0.00686	-0.02556	1.5	-	0.03199	-	4.5288	Aman
144	114.0990	-0.02556	-0.01213	-0.02556	1.5	-	0.03199	-	4.5288	Aman
145	114.0990	-0.02556	-0.01049	-0.02556	1.5	-	0.03199	-	4.5288	Aman
146	114.0990	-0.02556	-0.00879	-0.02556	1.5	-	0.03199	-	4.5288	Aman
147	114.0990	-0.02556	-0.01486	-0.02556	1.5	-	0.03199	-	4.5288	Aman
148	114.0990	-0.02556	-0.00682	-0.02556	1.5	-	0.03199	-	4.5288	Aman
149	114.0990	-0.02556	-0.01950	-0.02556	1.5	-	0.03199	-	4.5288	Aman

1	2	3	4	5	6	7	8	9	10	11
150	114,0990	-0,02556	-0,00675	-0,02556	1,5	-	0,03199	-	4,5288	Aman
151	114,0990	-0,02556	-0,02385	-0,02556	1,5	-	0,03199	-	4,5288	Aman
152	114,0990	-0,02556	-0,00901	-0,02556	1,5	-	0,03199	-	4,5288	Aman
153	114,0990	-0,02556	-0,02743	-0,02743	1,5	-	0,03433	-	4,5288	Aman
154	114,0990	-0,02556	-0,01432	-0,02556	1,5	-	0,03199	-	4,5288	Aman
155	114,0990	-0,02556	-0,02964	-0,02964	1,5	-	0,03710	-	4,5288	Aman
156	114,0990	-0,02556	-0,02381	-0,02556	1,5	-	0,03199	-	4,5288	Aman
157	114,0990	-0,02556	-0,02367	-0,02556	1,5	-	0,03199	-	4,5288	Aman
158	114,0990	-0,02556	-0,02979	-0,02979	1,5	-	0,03730	-	4,5288	Aman
159	114,0990	-0,02556	-0,01417	-0,02556	1,5	-	0,03199	-	4,5288	Aman
160	114,0990	-0,02556	-0,02759	-0,02759	1,5	-	0,03453	-	4,5288	Aman
161	114,0990	-0,02556	-0,00884	-0,02556	1,5	-	0,03199	-	4,5288	Aman
162	114,0990	-0,02556	-0,02405	-0,02556	1,5	-	0,03199	-	4,5288	Aman
163	114,0990	-0,02556	-0,00654	-0,02556	1,5	-	0,03199	-	4,5288	Aman
164	114,0990	-0,02556	-0,01978	-0,02556	1,5	-	0,03199	-	4,5288	Aman
165	114,0990	-0,02556	-0,00654	-0,02556	1,5	-	0,03199	-	4,5288	Aman
166	114,0990	-0,02556	-0,01529	-0,02556	1,5	-	0,03199	-	4,5288	Aman
167	114,0990	-0,02556	-0,00841	-0,02556	1,5	-	0,03199	-	4,5288	Aman
168	114,0990	-0,02556	-0,01117	-0,02556	1,5	-	0,03199	-	4,5288	Aman
169	114,0990	-0,02556	-0,01160	-0,02556	1,5	-	0,03199	-	4,5288	Aman
170	114,0990	-0,02556	-0,00792	-0,02556	1,5	-	0,03199	-	4,5288	Aman
171	114,0990	-0,02556	-0,01565	-0,02556	1,5	-	0,03199	-	4,5288	Aman
172	114,0990	-0,02556	-0,00602	-0,02556	1,5	-	0,03199	-	4,5288	Aman
173	114,0990	-0,02556	-0,02004	-0,02556	1,5	-	0,03199	-	4,5288	Aman
174	114,0990	-0,02556	-0,00600	-0,02556	1,5	-	0,03199	-	4,5288	Aman
175	114,0990	-0,02556	-0,02420	-0,02556	1,5	-	0,03199	-	4,5288	Aman
176	114,0990	-0,02556	-0,00830	-0,02556	1,5	-	0,03199	-	4,5288	Aman
177	114,0990	-0,02556	-0,02762	-0,02762	1,5	-	0,03457	-	4,5288	Aman
178	114,0990	-0,02556	-0,01364	-0,02556	1,5	-	0,03199	-	4,5288	Aman
179	114,0990	-0,02556	-0,02966	-0,02966	1,5	-	0,03712	-	4,5288	Aman
180	114,0990	-0,02556	-0,02315	-0,02556	1,5	-	0,03199	-	4,5288	Aman
181	114,0995	-0,02677	-0,03246	-0,02677	1,5	-	0,04063	-	4,5288	Aman
182	114,0995	-0,02677	-0,02411	-0,02677	1,5	-	0,03351	-	4,5288	Aman
183	114,0995	-0,02677	-0,02742	-0,02742	1,5	-	0,03432	-	4,5288	Aman
184	114,0995	-0,02677	-0,01855	-0,02677	1,5	-	0,03351	-	4,5288	Aman
185	114,0995	-0,02677	-0,02063	-0,02677	1,5	-	0,03351	-	4,5288	Aman
186	114,0995	-0,02677	-0,01932	-0,02677	1,5	-	0,03351	-	4,5288	Aman
187	114,0995	-0,02677	-0,02906	-0,02906	1,5	-	0,03637	-	4,5288	Aman
188	114,0995	-0,02677	-0,00508	-0,02677	1,5	-	0,03551	-	4,5288	Aman

1	2	3	4	5	6	7	8	9	7	9
189	114,0995	-0,02677	-0,01901	-0,02677	1,5	-	0,03351	-	4,5288	Aman
190	114,0995	-0,02677	-0,00956	-0,02677	1,5	-	0,03351	-	4,5288	Aman
191	114,0995	-0,02677	-0,01527	-0,02677	1,5	-	0,03351	-	4,5288	Aman
192	114,0995	-0,02677	-0,01163	-0,02677	1,5	-	0,03351	-	4,5288	Aman
193	114,0995	-0,02677	-0,01311	-0,02677	1,5	-	0,03351	-	4,5288	Aman
194	114,0995	-0,02677	-0,01411	-0,02677	1,5	-	0,03351	-	4,5288	Aman
195	114,0995	-0,02677	-0,01212	-0,02677	1,5	-	0,03351	-	4,5288	Aman
196	114,0995	-0,02677	-0,01715	-0,02677	1,5	-	0,03351	-	4,5288	Aman
197	114,0995	-0,02677	-0,01256	-0,02677	1,5	-	0,03351	-	4,5288	Aman
198	114,0995	-0,02677	-0,02059	-0,02677	1,5	-	0,03351	-	4,5288	Aman
199	114,0995	-0,02677	-0,01460	-0,02677	1,5	-	0,03351	-	4,5288	Aman
200	114,0995	-0,02677	-0,02423	-0,02677	1,5	-	0,03351	-	4,5288	Aman
201	114,0995	-0,02677	-0,01853	-0,02677	1,5	-	0,03351	-	4,5288	Aman
202	114,0995	-0,02677	-0,02813	-0,02813	1,5	-	0,03521	-	4,5288	Aman
203	114,0995	-0,02677	-0,02459	-0,02677	1,5	-	0,03351	-	4,5288	Aman
204	114,0995	-0,02677	-0,03283	-0,03283	1,5	-	0,04109	-	4,5288	Aman
205	114,0995	-0,02677	-0,03300	-0,03300	1,5	-	0,04130	-	4,5288	Aman
206	114,0995	-0,02677	-0,02443	-0,02677	1,5	-	0,03351	-	4,5288	Aman
207	114,0995	-0,02677	-0,02832	-0,02832	1,5	-	0,03545	-	4,5288	Aman
208	114,0995	-0,02677	-0,01837	-0,02677	1,5	-	0,03351	-	4,5288	Aman
209	114,0995	-0,02677	-0,02445	-0,02677	1,5	-	0,03351	-	4,5288	Aman
210	114,0995	-0,02677	-0,01442	-0,02677	1,5	-	0,03351	-	4,5288	Aman
211	114,0995	-0,02677	-0,02086	-0,02677	1,5	-	0,03351	-	4,5288	Aman
212	114,0995	-0,02677	-0,01237	-0,02677	1,5	-	0,03351	-	4,5288	Aman
213	114,0995	-0,02677	-0,01751	-0,02677	1,5	-	0,03351	-	4,5288	Aman
214	114,0995	-0,02677	-0,01193	-0,02677	1,5	-	0,03351	-	4,5288	Aman
215	114,0995	-0,02677	-0,01462	-0,02677	1,5	-	0,03351	-	4,5288	Aman
216	114,0995	-0,02677	-0,01292	-0,02677	1,5	-	0,03351	-	4,5288	Aman
217	114,0995	-0,02677	-0,01248	-0,02677	1,5	-	0,03351	-	4,5288	Aman
218	114,0995	-0,02677	-0,01501	-0,02677	1,5	-	0,03351	-	4,5288	Aman
219	114,0995	-0,02677	-0,01147	-0,02677	1,5	-	0,03351	-	4,5288	Aman
220	114,0995	-0,02677	-0,01780	-0,02677	1,5	-	0,03351	-	4,5288	Aman
221	114,0995	-0,02677	-0,01190	-0,02677	1,5	-	0,03351	-	4,5288	Aman
222	114,0995	-0,02677	-0,02103	-0,02677	1,5	-	0,03351	-	4,5288	Aman
223	114,0995	-0,02677	-0,01396	-0,02677	1,5	-	0,03351	-	4,5288	Aman
224	114,0995	-0,02677	-0,02447	-0,02677	1,5	-	0,03351	-	4,5288	Aman
225	114,0995	-0,02677	-0,01794	-0,02677	1,5	-	0,03351	-	4,5288	Aman
226	114,0995	-0,02677	-0,02818	-0,02818	1,5	-	0,03527	-	4,5288	Aman
227	114,0995	-0,02677	-0,02405	-0,02677	1,5	-	0,03351	-	4,5288	Aman

1	2	3	4	5	6	7	8	9	10	11
228	114.0995	-0.02677	-0.03266	-0.03266	1.5	-	0.04088	-	4.5288	Aman
229	106.9151	-0.02798	-0.03432	-0.03432	1.5	-	0.04295	-	5.1579	Aman
230	106.9151	-0.02798	-0.02692	-0.02798	1.5	-	0.03502	-	5.1579	Aman
231	106.9151	-0.02798	-0.02961	-0.02961	1.5	-	0.03706	-	5.1579	Aman
232	106.9151	-0.02798	-0.02368	-0.02798	1.5	-	0.03502	-	5.1579	Aman
233	106.9151	-0.02798	-0.02154	-0.02798	1.5	-	0.03502	-	5.1579	Aman
234	106.9151	-0.02798	-0.02648	-0.02798	1.5	-	0.03502	-	5.1579	Aman
235	106.9151	-0.02798	-0.03143	-0.03143	1.5	-	0.03934	-	5.1579	Aman
236	106.9151	-0.02798	-0.01120	-0.02798	1.5	-	0.03502	-	5.1579	Aman
237	106.9151	-0.02798	-0.02099	-0.02798	1.5	-	0.03502	-	5.1579	Aman
238	106.9151	-0.02798	-0.01625	-0.02798	1.5	-	0.03502	-	5.1579	Aman
239	106.9151	-0.02798	-0.01787	-0.02798	1.5	-	0.03502	-	5.1579	Aman
240	106.9151	-0.02798	-0.01744	-0.02798	1.5	-	0.03502	-	5.1579	Aman
241	106.9151	-0.02798	-0.01695	-0.02798	1.5	-	0.03502	-	5.1579	Aman
242	106.9151	-0.02798	-0.01855	-0.02798	1.5	-	0.03502	-	5.1579	Aman
243	106.9151	-0.02798	-0.01716	-0.02798	1.5	-	0.03502	-	5.1579	Aman
244	106.9151	-0.02798	-0.02063	-0.02798	1.5	-	0.03502	-	5.1579	Aman
245	106.9151	-0.02798	-0.01792	-0.02798	1.5	-	0.03502	-	5.1579	Aman
246	106.9151	-0.02798	-0.02351	-0.02798	1.5	-	0.03502	-	5.1579	Aman
247	106.9151	-0.02798	-0.01949	-0.02798	1.5	-	0.03502	-	5.1579	Aman
248	106.9151	-0.02798	-0.02710	-0.02798	1.5	-	0.03502	-	5.1579	Aman
249	106.9151	-0.02798	-0.02218	-0.02798	1.5	-	0.03502	-	5.1579	Aman
250	106.9151	-0.02798	-0.03128	-0.03128	1.5	-	0.03915	-	5.1579	Aman
251	106.9151	-0.02798	-0.02662	-0.02798	1.5	-	0.03502	-	5.1579	Aman
252	106.9151	-0.02798	-0.03503	-0.03503	1.5	-	0.04384	-	5.1579	Aman
253	106.9151	-0.02798	-0.03484	-0.03484	1.5	-	0.04361	-	5.1579	Aman
254	106.9151	-0.02798	-0.02683	-0.02798	1.5	-	0.03502	-	5.1579	Aman
255	106.9151	-0.02798	-0.03109	-0.03109	1.5	-	0.03502	-	5.1579	Aman
256	106.9151	-0.02798	-0.02242	-0.02798	1.5	-	0.03502	-	5.1579	Aman
257	106.9151	-0.02798	-0.02692	-0.02798	1.5	-	0.03502	-	5.1579	Aman
258	106.9151	-0.02798	-0.01978	-0.02798	1.5	-	0.03502	-	5.1579	Aman
259	106.9151	-0.02798	-0.02333	-0.02798	1.5	-	0.03502	-	5.1579	Aman
260	106.9151	-0.02798	-0.01828	-0.02798	1.5	-	0.03502	-	5.1579	Aman
261	106.9151	-0.02798	-0.02046	-0.02798	1.5	-	0.03502	-	5.1579	Aman
262	106.9151	-0.02798	-0.01747	-0.02798	1.5	-	0.03502	-	5.1579	Aman
263	106.9151	-0.02798	-0.01861	-0.02798	1.5	-	0.03502	-	5.1579	Aman
264	106.9151	-0.02798	-0.01735	-0.02798	1.5	-	0.03502	-	5.1579	Aman
265	106.9151	-0.02798	-0.01781	-0.02798	1.5	-	0.03502	-	5.1579	Aman
266	106.9151	-0.02798	-0.01807	-0.02798	1.5	-	0.03502	-	5.1579	Aman

1	2	3	4	5	6	7	8	9	10	11
267	106.9151	-0.02798	-0.01791	-0.02798	1.5	-	0.03502	-	5.1579	Aman
268	106.9151	-0.02798	-0.02003	-0.02798	1.5	-	0.03502	-	5.1579	Aman
269	106.9151	-0.02798	-0.01850	-0.02798	1.5	-	0.03502	-	5.1579	Aman
270	106.9151	-0.02798	-0.02290	-0.02798	1.5	-	0.03502	-	5.1579	Aman
271	106.9151	-0.02798	-0.01987	-0.02798	1.5	-	0.03502	-	5.1579	Aman
272	106.9151	-0.02798	-0.02654	-0.02798	1.5	-	0.03502	-	5.1579	Aman
273	106.9151	-0.02798	-0.02234	-0.02798	1.5	-	0.03502	-	5.1579	Aman
274	106.9151	-0.02798	-0.03082	-0.03082	1.5	-	0.03857	-	5.1579	Aman
275	106.9151	-0.02798	-0.02651	-0.02798	1.5	-	0.03502	-	5.1579	Aman
276	106.9151	-0.02798	-0.03475	-0.03475	1.5	-	0.04350	-	5.1579	Aman
277	106.9152	-0.03555	-0.04006	-0.04006	1.5	-	0.03014	-	5.1579	Aman
278	106.9152	-0.03312	-0.03716	-0.03716	1.5	-	0.04651	-	5.1579	Aman
279	106.9152	-0.03311	-0.02885	-0.03311	1.5	-	0.04144	-	5.1579	Aman
280	106.9152	-0.03556	-0.04060	-0.04060	1.5	-	0.05082	-	5.1579	Aman
281	106.9152	-0.03556	-0.02977	-0.03556	1.5	-	0.04451	-	5.1579	Aman
282	106.9152	-0.03311	-0.03520	-0.03520	1.5	-	0.04406	-	5.1579	Aman
283	106.9152	-0.03312	-0.02108	-0.03312	1.5	-	0.04145	-	5.1579	Aman
284	106.9152	-0.03555	-0.03877	-0.03877	1.5	-	0.04852	-	5.1579	Aman
285	106.9152	-0.03555	-0.02711	-0.03555	1.5	-	0.04449	-	5.1579	Aman
286	106.9152	-0.03312	-0.02701	-0.03312	1.5	-	0.04145	-	5.1579	Aman
287	106.9152	-0.03311	-0.02197	-0.03311	1.5	-	0.0414	-	5.1579	Aman
288	106.9152	-0.03556	-0.03035	-0.03556	1.5	-	0.04451	-	5.1579	Aman
289	106.9152	-0.03556	-0.03011	-0.03556	1.5	-	0.04151	-	5.1579	Aman
290	106.9152	-0.03311	-0.02245	-0.03311	1.5	-	0.04144	-	5.1579	Aman
291	106.9152	-0.03312	-0.02649	-0.03312	1.5	-	0.04145	-	5.1579	Aman
292	106.9152	-0.03555	-0.02837	-0.03555	1.5	-	0.04449	-	5.1579	Aman
293	106.9152	-0.03555	-0.03726	-0.03726	1.5	-	0.04663	-	5.1579	Aman
294	106.9152	-0.03312	-0.02099	-0.03312	1.5	-	0.04145	-	5.1579	Aman
295	106.9152	-0.03311	-0.03485	-0.03485	1.5	-	0.04237	-	5.1579	Aman
296	106.9152	-0.03556	-0.02820	-0.03556	1.5	-	0.04451	-	5.1579	Aman
297	106.9152	-0.03556	-0.04187	-0.04187	1.5	-	0.05240	-	5.1579	Aman
298	106.9152	-0.03311	-0.02780	-0.03311	1.5	-	0.04144	-	5.1579	Aman
299	106.9152	-0.03312	-0.03820	-0.03820	1.5	-	0.04781	-	5.1579	Aman
300	106.9152	-0.03555	-0.03956	-0.03956	1.5	-	0.04952	-	5.1579	Aman
301	106.9152	-0.03555	-0.03982	-0.03982	1.5	-	0.04984	-	5.1579	Aman
302	106.9152	-0.03312	-0.03796	-0.03796	1.5	-	0.04751	-	5.1579	Aman
303	106.9152	-0.03311	-0.02808	-0.03311	1.5	-	0.04144	-	5.1579	Aman
304	106.9152	-0.03556	-0.04167	-0.04167	1.5	-	0.05215	-	5.1579	Aman
305	106.9152	-0.03556	-0.02849	-0.03556	1.5	-	0.04451	-	5.1579	Aman

1	2	3	4	5	6	7	8	9	10	11
306	106,9152	-0,03311	-0,03470	-0,03470	1,5	-	0,04343	-	5,1579	Aman
307	106,9152	-0,03312	-0,02126	-0,03312	1,5	-	0,04145	-	5,1579	Aman
308	106,9152	-0,03555	-0,03722	-0,03722	1,5	-	0,04658	-	5,1579	Aman
309	106,9152	-0,03555	-0,02857	-0,03555	1,5	-	0,04449	-	5,1579	Aman
310	106,9152	-0,03312	-0,02648	-0,03312	1,5	-	0,04145	-	5,1579	Aman
311	106,9152	-0,03311	-0,02266	-0,03311	1,5	-	0,04144	-	5,1579	Aman
312	106,9152	-0,03556	-0,03052	-0,03556	1,5	-	0,04451	-	5,1579	Aman
313	106,9152	-0,03556	-0,03016	-0,03556	1,5	-	0,04451	-	5,1579	Aman
314	106,9152	-0,03311	-0,02291	-0,03311	1,5	-	0,04144	-	5,1579	Aman
315	106,9152	-0,03312	-0,02618	-0,03312	1,5	-	0,04145	-	5,1579	Aman
316	106,9152	-0,03555	-0,02889	-0,03555	1,5	-	0,04449	-	5,1579	Aman
317	106,9152	-0,03555	-0,03679	-0,03679	1,5	-	0,04605	-	5,1579	Aman
318	106,9152	-0,03312	-0,02141	-0,03312	1,5	-	0,04145	-	5,1579	Aman
319	106,9152	-0,03311	-0,03438	-0,03438	1,5	-	0,04303	-	5,1579	Aman
320	106,9152	-0,03556	-0,02843	-0,03556	1,5	-	0,04451	-	5,1579	Aman
321	106,9152	-0,03556	-0,04151	-0,04151	1,5	-	0,05195	-	5,1579	Aman
322	106,9152	-0,03311	-0,02776	-0,03311	1,5	-	0,04144	-	5,1579	Aman
323	106,9152	-0,03312	-0,03807	-0,03807	1,5	-	0,04765	-	5,1579	Aman
324	106,9152	-0,03555	-0,03917	-0,03917	1,5	-	0,04902	-	5,1579	Aman
325	106,6891	-0,04848	-0,04479	-0,04848	1,5	-	0,06068	-	5,1795	Aman
326	106,6891	-0,04849	-0,05565	-0,05565	1,5	-	0,06965	-	5,1795	Aman
327	106,6891	-0,04849	-0,03563	-0,04849	1,5	-	0,06069	-	5,1795	Aman
328	106,6891	-0,04848	-0,05572	-0,05572	1,5	-	0,06974	-	5,1795	Aman
329	106,6891	-0,04848	-0,03643	-0,04848	1,5	-	0,06068	-	5,1795	Aman
330	106,6891	-0,04849	-0,04695	-0,04849	1,5	-	0,06069	-	5,1795	Aman
331	106,6891	-0,04849	-0,04631	-0,04849	1,5	-	0,06069	-	5,1795	Aman
332	106,6891	-0,04848	-0,03701	-0,04848	1,5	-	0,06069	-	5,1795	Aman
333	106,6891	-0,04848	-0,05539	-0,05539	1,5	-	0,06933	-	5,1795	Aman
334	106,6891	-0,04849	-0,03524	-0,04849	1,5	-	0,06069	-	5,1795	Aman
335	106,6891	-0,04849	-0,05637	-0,05637	1,5	-	0,07035	-	5,1795	Aman
336	106,6891	-0,04848	-0,04404	-0,04848	1,5	-	0,06068	-	5,1795	Aman
337	106,6891	-0,04848	-0,04440	-0,04848	1,5	-	0,06068	-	5,1795	Aman
338	106,6891	-0,04849	-0,05608	-0,05608	1,5	-	0,07019	-	5,1795	Aman
339	106,6891	-0,04849	-0,03549	-0,04849	1,5	-	0,06069	-	5,1795	Aman
340	106,6891	-0,04848	-0,05533	-0,05533	1,5	-	0,06925	-	5,1795	Aman
341	106,6891	-0,04848	-0,03694	-0,04848	1,5	-	0,06068	-	5,1795	Aman
342	106,6891	-0,04849	-0,04670	-0,04849	1,5	-	0,06069	-	5,1795	Aman
343	106,6891	-0,04849	-0,04627	-0,04849	1,5	-	0,06069	-	5,1795	Aman
344	106,6891	-0,04848	-0,03728	-0,04848	1,5	-	0,06068	-	5,1795	Aman

1	2	3	4	5	6	7	8	9	10	11
345	106.6891	-0.04848	-0.05506	-0.05506	1.5	-	0.06891	-	5.1795	Aman
346	106.6891	-0.04849	-0.03549	-0.04849	1.5	-	0.06069	-	5.1795	Aman
347	106.6891	-0.04849	-0.05628	-0.05628	1.5	-	0.07044	-	5.1795	Aman
348	106.6891	-0.04848	-0.04386	-0.04848	1.5	-	0.06068	-	5.1795	Aman
349	106.6891	-0.53317	-0.53748	-0.53748	1.5	-	0.67270	-	9.6360	Aman
350	100.2873	-0.53317	-0.52141	-0.53317	1.5	-	0.66730	-	9.6360	Aman
351	100.2873	-0.53317	-0.53707	-0.53707	1.5	-	0.67218	-	9.6360	Aman
352	100.2873	-0.53317	-0.53732	-0.53732	1.5	-	0.67250	-	9.6360	Aman
353	100.2873	-0.53317	-0.52157	-0.53317	1.5	-	0.66730	-	9.6360	Aman
354	100.2873	-0.53317	-0.53694	-0.53694	1.5	-	0.67202	-	9.6360	Aman
355	106.6891	-0.09856	-0.11088	-0.11088	1.5	-	0.13877	-	5.1795	Aman
356	106.6891	-0.09856	-0.10260	-0.10260	1.5	-	0.12841	-	5.1795	Aman
357	106.6891	-0.09856	-0.09709	-0.09856	1.5	-	0.12335	-	5.1795	Aman
358	106.6891	-0.09856	-0.09154	-0.09856	1.5	-	0.12335	-	5.1795	Aman
359	106.6891	-0.09856	-0.09678	-0.09856	1.5	-	0.12335	-	5.1795	Aman
360	106.6891	-0.09856	-0.10155	-0.09856	1.5	-	0.12710	-	5.1795	Aman
361	106.6891	-0.09856	-0.11110	-0.11110	1.5	-	0.13905	-	5.1795	Aman
362	106.6891	-0.09856	-0.10168	-0.10168	1.5	-	0.12726	-	5.1795	Aman
363	106.6891	-0.09856	-0.09695	-0.09856	1.5	-	0.12335	-	5.1795	Aman
364	106.6891	-0.09856	-0.09186	-0.09856	1.5	-	0.12335	-	5.1795	Aman
365	106.6891	-0.09856	-0.09678	-0.09856	1.5	-	0.12335	-	5.1795	Aman
366	106.6891	-0.09856	-0.10136	-0.10136	1.5	-	0.12686	-	5.1795	Aman
367	100.2873	-0.53316	-0.54647	-0.54647	1.5	-	0.68394	-	9.6360	Aman
368	100.2873	-0.53316	-0.52850	-0.53316	1.5	-	0.66728	-	9.6360	Aman
369	100.2873	-0.53316	-0.52807	-0.53316	1.5	-	0.66728	-	9.6360	Aman
370	100.2873	-0.53316	-0.54657	-0.54657	1.5	-	0.68407	-	9.6360	Aman
371	100.2873	-0.53316	-0.52842	-0.53316	1.5	-	0.66728	-	9.6360	Aman
372	100.2873	-0.53316	-0.52813	-0.53316	1.5	-	0.66728	-	9.6360	Aman

Tabel 4.8 : Perhitungan Sambungan Baut

Joint	P max (Kips)	D (in)	A (in ²)	ft (ksi)	Ft (ksi)	Chek
1 – 24	0,02979	0,625	0,3068	0,03730	20,0	Aman
25 – 48	0,08641	0,625	0,3068	0,10815	20,0	Aman
49 – 72	0,07401	0,625	0,3068	0,09263	20,0	Aman
73 – 96	0,10533	0,625	0,3068	0,13183	20,0	Aman
97 – 120	0,15797	0,625	0,3068	0,19771	20,0	Aman
121 – 132	0,70710	0,625	0,3068	0,88498	20,0	Aman
133	0,54657	0,625	0,3068	0,68407	20,0	Aman

