

KARTU PESERTA TUGAS AKHIR

NO.	N A M A	NO. MHS.	BID.STUDI
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JUDUL TUGAS AKHIR :

Perilaku kuda - kuda papan dengan alat sambung Claw Nailplate

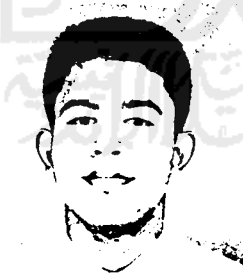
PERIODE II : DESEMBER - MEI

TAHUN : 2002 / 2003

No.	Kegiatan	Bulan Ke :					
		Des.	Jan.	Peb.	Mar.	Apr.	Mei.
1.	Pendaftaran	■					
2.	Penentuan Dosen Pembimbing	■					
3.	Pembuatan Proposal		■				
4.	Seminar Proposal			■			
5.	Konsultasi Penyusunan TA.				■		
6.	Sidang-Sidang					■	
7.	Pendadaran.						■

DOSEN PEMBIMBING I
DOSEN PEMBIMBING II

Ir. Iri Fajar Budiono, MT.
Ir. H. Sutaryatno, MT



Yogyakarta, 08 Jan 2003

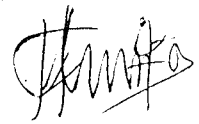


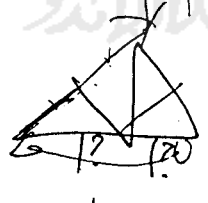
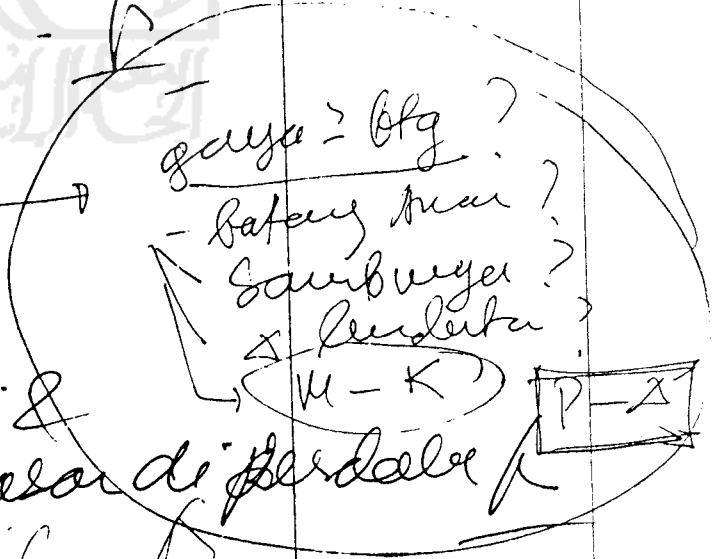
Ir. H. Muqadim, MS
Dekan,

(.....)


Catatan.

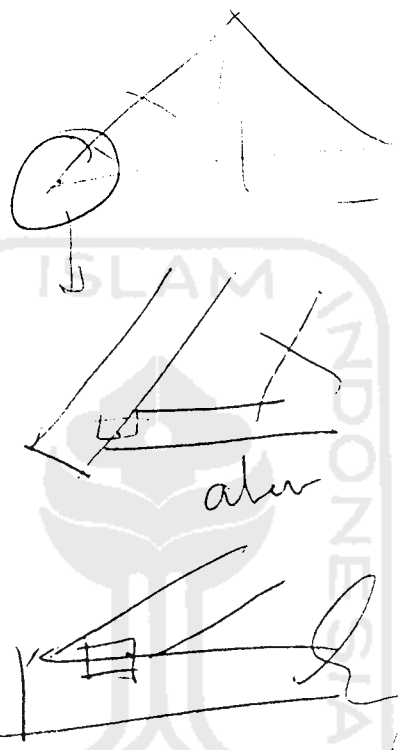


Seminar : ..20..februari..2003.....
Sidang :
Pendadaran :

CATATAN KONSULTASI TUGAS AKHIR

NO	TANGGAL	CATATAN KONSULTASI	TANDA TANGAN
	3/2/03	- perbaikan tinjauan pustaka - penyediaan tabel min papam kayu	
	5/2/03	- perbaikan batasan masalah - ke DPIT	
	13/2/03	- uji siluman ?	
	14/2/03	Perbaikan k	
	17/2/03	K Siapha Semina k	
	5/3/03	Langkah k	
	3/3/03	Langkah Perbaikan - O	
	2/5/03	Langkah 2 Perbaikan - k	
	22/5/03	Perbaikan - k	
	24/5/03		
	12/6/03	Perbaikan & Bembanasan di Perbaikan k	
	16/6/03	Perbaikan k	

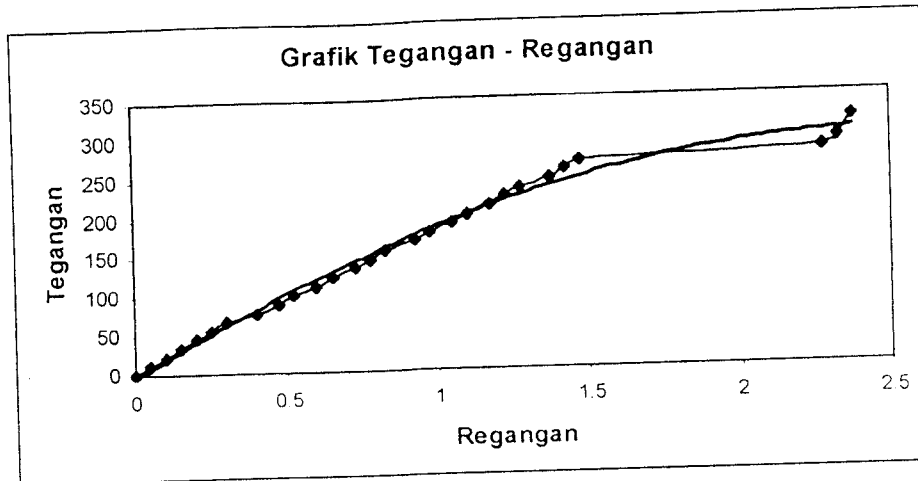
17/6/03 Perbaikan k

1/7/03 Joo Japadilanjut
ke DPIT 

No	Tanggal	Catatan Konsultasi	Tanda Tangan
	3/7/03	<p>- pembahasan ditengokan dengan P >> Hp Δ <<<</p> <p>- gambar detail camberges</p> 	
	7/7/03 10/7/03	<p>Pembahasan ditengokan Siophan Sidang</p>	

Pengujian Kuat Desak Kayu // Serat Sampel 1

Beban (kg)	AL (x10 ⁻³ Cm)	Tegangan $\sigma = P/A$ (Kg/Cm ²)	Regangan $\epsilon = \Delta L/t$ (x10 ⁻³)	X (x10 ⁻³)	Reg. Terkoreksi (x10E-3)	E (Kg/Cm ²)
0	0	0	0	0	0	
100	1.5	11.11111111	0.075	-0.025	0.05	
200	2.5	22.22222222	0.125	-0.025	0.1	
300	3.5	33.33333333	0.175	-0.025	0.15	
400	4.5	44.44444444	0.225	-0.025	0.2	
500	5.5	55.55555556	0.275	-0.025	0.25	
600	6.5	66.66666667	0.325	-0.025	0.3	222222.222
700	8.5	77.77777778	0.425	-0.025	0.4	
800	10	88.88888889	0.5	-0.025	0.475	
900	11	100	0.55	-0.025	0.525	
1000	12.5	111.1111111	0.625	-0.025	0.6	
1100	13.5	122.2222222	0.675	-0.025	0.65	
1200	15	133.3333333	0.75	-0.025	0.725	
1300	16	144.4444444	0.8	-0.025	0.775	
1400	17	155.5555556	0.85	-0.025	0.825	
1500	19	166.6666667	0.95	-0.025	0.925	
1600	20	177.7777778	1	-0.025	0.975	
1700	21.5	188.8888889	1.075	-0.025	1.05	
1800	22.5	200	1.125	-0.025	1.1	
1900	24	211.1111111	1.2	-0.025	1.175	
2000	25	222.2222222	1.25	-0.025	1.225	
2100	26	233.3333333	1.3	-0.025	1.275	
2200	28	244.4444444	1.4	-0.025	1.375	
2300	29	255.5555556	1.45	-0.025	1.425	
2400	30	266.6666667	1.5	-0.025	1.475	
2500	46	277.7777778	2.3	-0.025	2.275	
2600	47	288.8888889	2.35	-0.025	2.325	
2845	48	316.1111111	2.4	-0.025	2.375	



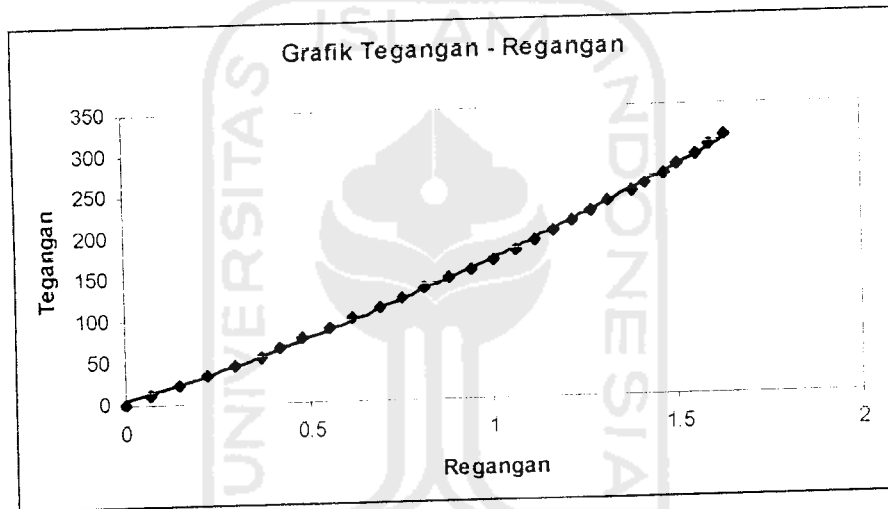
Gambar Grafik Tegangan – Regangan hasil uji desak kayu // serat Sampel 1

Pengujian Kuat Desak Kayu // Serat Sampel 2

Beban (kg)	AL ($\times 10^{-3}$ Cm)	Tegangan $\sigma = P/A$ (Kg/Cm ²)	Regangan $\epsilon = \Delta L/l$ ($\times 10^{-3}$)	X ($\times 10^{-3}$)	Reg. Terkoreksi ($\times 10^{-3}$)	E (Kg/Cm ²)
0	0	0	0	0	0	
100	3	11.11111111	0.15	-0.08125	0.06875	
200	4.5	22.22222222	0.225	-0.08125	0.14375	
300	6	33.33333333	0.3	-0.08125	0.21875	
400	7.5	44.44444444	0.375	-0.08125	0.29375	
500	9	55.55555556	0.45	-0.08125	0.36875	150659.133
600	10	66.66666667	0.5	-0.08125	0.41875	
700	11.25	77.77777778	0.5625	-0.08125	0.48125	
800	12.75	88.88888889	0.6375	-0.08125	0.55625	
900	14	100	0.7	-0.08125	0.61875	
1000	15.5	111.1111111	0.775	-0.08125	0.69375	
1100	16.75	122.2222222	0.8375	-0.08125	0.75625	
1200	18	133.3333333	0.9	-0.08125	0.81875	
1300	19.25	144.4444444	0.9625	-0.08125	0.88125	
1400	20.5	155.5555556	1.025	-0.08125	0.94375	
1500	21.75	166.6666667	1.0875	-0.08125	1.00625	
1600	23	177.7777778	1.15	-0.08125	1.06875	
1700	24	188.8888889	1.2	-0.08125	1.11875	
1800	25	200	1.25	-0.08125	1.16875	
1900	26	211.1111111	1.3	-0.08125	1.21875	
2000	27	222.2222222	1.35	-0.08125	1.26875	

Lanjutan tabel Pengujian Kuat Desak Kayu // Serat Sampel 2

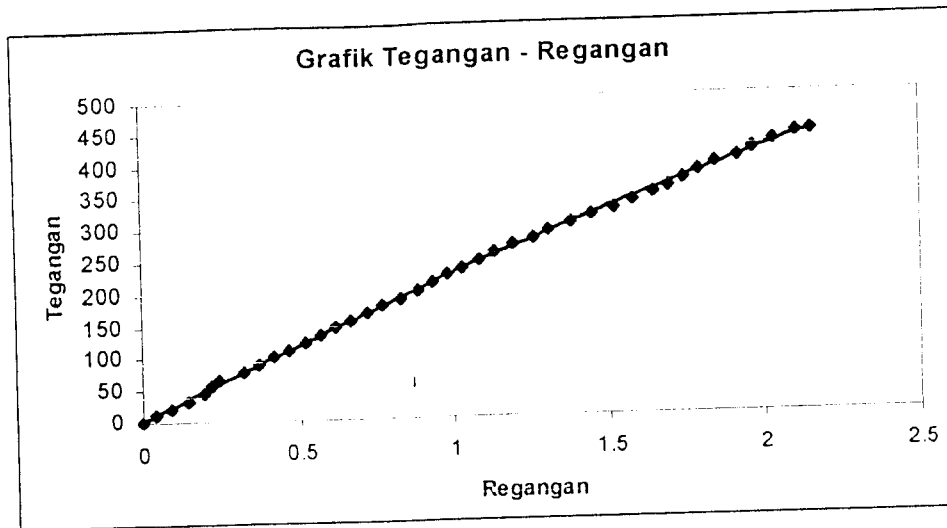
Beban (kg)	AL (x10 ⁻³ Cm)	Tegangan $\sigma = P/A$ (Kg/Cm ²)	Regangan $\epsilon = \Delta L/t$ (x10 ⁻³)	X (x10 ⁻³)	Reg. Terkoreksi (x10 ⁻³)	E (Kg/Cm ²)
2100	28	233.3333333	1.4	-0.08125	1.31875	
2200	29.25	244.4444444	1.4625	-0.08125	1.38125	
2300	30	255.5555556	1.5	-0.08125	1.41875	
2400	31	266.6666667	1.55	-0.08125	1.46875	
2500	31.75	277.7777778	1.5875	-0.08125	1.50625	
2600	32.75	288.8888889	1.6375	-0.08125	1.55625	
2700	33.5	300	1.675	-0.08125	1.59375	
2800	34.25	311.1111111	1.7125	-0.08125	1.63125	



Gambar Grafik Tegangan - Regangan hasil uji desak kayu // serat Sampel 2

Pengujian Kuat Desak Kayu // Serat Sampel 3

Beban (kg)	AL (x10 ⁻³ Cm)	Tegangan $\sigma = P/A$ (Kg/Cm ²)	Regangan $\epsilon = \Delta L/t$ (x10 ⁻³)	X (x10 ⁻³)	Reg. Terkoreksi (x10 ⁻³)	E (Kg/Cm ³)
0	0	0	0	0	0	
100	2	11.11111111	0.1	-0.05625	0.04375	
200	3	22.22222222	0.15	-0.05625	0.09375	
300	4	33.33333333	0.2	-0.05625	0.14375	
400	5	44.44444444	0.25	-0.05625	0.19375	229390.681
500	5.5	55.55555556	0.275	-0.05625	0.21875	
600	6	66.66666667	0.3	-0.05625	0.24375	
700	7.5	77.77777778	0.375	-0.05625	0.31875	
800	8.5	88.88888889	0.425	-0.05625	0.36875	
900	9.5	100	0.475	-0.05625	0.41875	
1000	10.5	111.1111111	0.525	-0.05625	0.46875	
1100	11.5	122.2222222	0.575	-0.05625	0.51875	
1200	12.5	133.3333333	0.625	-0.05625	0.56875	
1300	13.5	144.4444444	0.675	-0.05625	0.61875	
1400	14.5	155.5555556	0.725	-0.05625	0.66875	
1500	15.5	166.6666667	0.775	-0.05625	0.71875	
1600	16.5	177.7777778	0.825	-0.05625	0.76875	
1700	17.75	188.8888889	0.8875	-0.05625	0.83125	
1800	18.75	200	0.9375	-0.05625	0.88125	
1900	19.75	211.1111111	0.9875	-0.05625	0.93125	
2000	20.75	222.2222222	1.0375	-0.05625	0.98125	
2100	21.75	233.3333333	1.0875	-0.05625	1.03125	
2200	22.75	244.4444444	1.1375	-0.05625	1.08125	
2300	23.75	255.5555556	1.1875	-0.05625	1.13125	
2400	25	266.6666667	1.25	-0.05625	1.19375	
2500	26.25	277.7777778	1.3125	-0.05625	1.25625	
2600	27.25	288.8888889	1.3625	-0.05625	1.30625	
2700	28.75	300	1.4375	-0.05625	1.38125	
2800	30	311.1111111	1.5	-0.05625	1.44375	
2900	31.5	322.2222222	1.575	-0.05625	1.51875	
3000	32.75	333.3333333	1.6375	-0.05625	1.58125	
3100	34	344.4444444	1.7	-0.05625	1.64375	
3200	35	355.5555556	1.75	-0.05625	1.69375	
3300	36	366.6666667	1.8	-0.05625	1.74375	
3400	37	377.7777778	1.85	-0.05625	1.79375	
3500	38	388.8888889	1.9	-0.05625	1.84375	
3600	39.5	400	1.975	-0.05625	1.91875	
3700	40.5	411.1111111	2.025	-0.05625	1.96875	
3800	41.75	422.2222222	2.0875	-0.05625	2.03125	
3900	43.25	433.3333333	2.1625	-0.05625	2.10625	
3930	44.25	436.6666667	2.2125	-0.05625	2.15625	

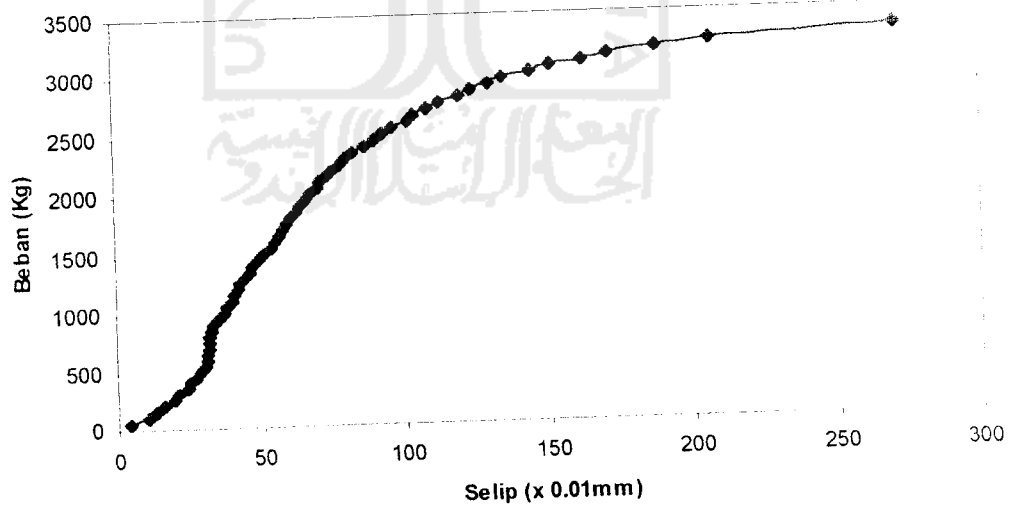


Gambar Grafik Tegangan – Regangan hasil uji desak kayu // serat Sampel 3



Hasil Pungujian Kuat Gesar Claw Nailplate 4 C 3

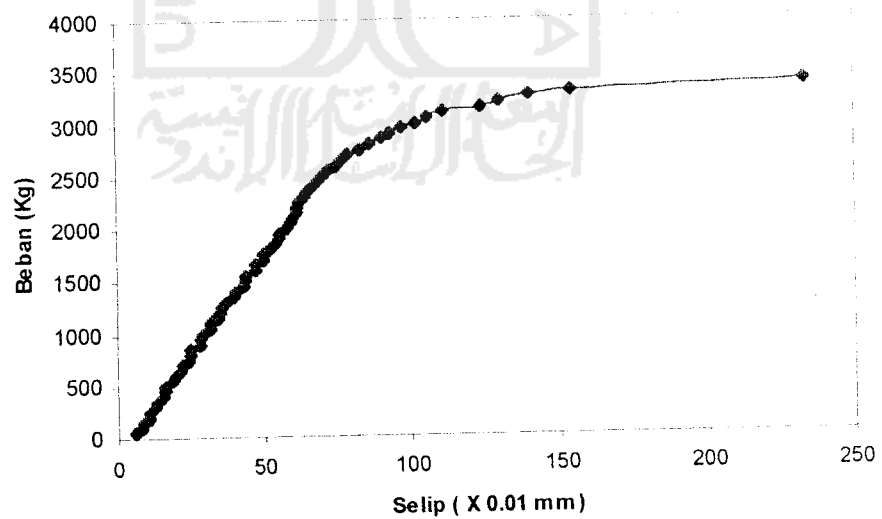
Beban (Kg)	Δ (mm) 10^{-2}	Beban (Kg)	Δ (mm) 10^{-2}	Beban (Kg)	Δ (mm) 10^{-2}
50	4	1150	40.5	2250	78
100	10	1200	42	2300	80
150	13	1250	43	2350	83
200	16	1300	45	2400	87
250	19	1350	46	2450	90
300	21	1400	47	2500	93
350	24	1450	49	2550	96.5
400	25	1500	51	2600	102
450	27	1550	54	2650	104
500	28	1600	55	2700	109
550	30	1650	56.5	2750	113
600	31	1700	58	2800	120
650	31	1750	59	2850	124
700	31.5	1800	61	2900	130
750	32	1850	63	2950	135
800	32	1900	64	3000	145
850	32.5	1950	66	3050	152
900	33	2000	67.5	3100	163
950	35.5	2050	70	3150	172
1000	37.5	2100	71	3200	188
1050	38	2150	73.5	3250	207
1100	40	2200	75	3330	271



Gambar Grafik Hubungan Beban – Selip alat sambung Claw Nailplate 4 C 3

Hasil Pengujian Kuat Geser Claw Nailplate 6 C 3

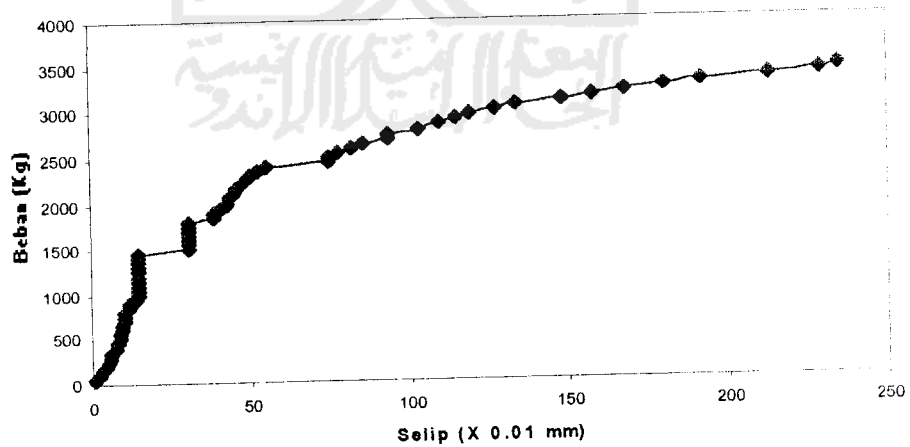
Beban (Kg)	Δ (mm) 10^{-2}	Beban (Kg)	Δ (mm) 10^{-2}	Beban (Kg)	Δ (mm) 10^{-2}
50	6	1150	34.5	2300	64
100	8	1200	35.25	2350	65
150	9	1250	36	2400	67
200	10.5	1300	37	2450	69
250	11	1350	40	2500	70
300	12.5	1400	40.5	2550	72
350	13.5	1450	43	2600	75
400	15.5	1500	43.5	2650	77
450	16	1550	44	2700	79
500	16.5	1600	47.5	2750	83
550	19	1650	47.5	2800	86
600	19.5	1700	50	2850	90
650	21.5	1750	50	2900	93
700	22	1800	52	2950	97
750	24.5	1850	54	3000	102
800	25	1900	55	3050	106
850	25.25	1950	55	3100	111
900	28	2000	58	3150	124
950	28.5	2050	59	3200	130
1000	29.25	2100	60	3250	140
1050	31.5	2150	61	3300	154
1100	32	2200	61	3370	233
1150	33	2250	62		



Gambar Grafik Hubungan Beban – Selip alat sambung Claw Nailplate 6 C 3

Tabel Hasil Pungujian Kuat Geser Claw Nailplate 8 C 3

Beban (Kg)	Δ (mm) 10^{-2}	Beban (Kg)	Δ (mm) 10^{-2}	Beban (Kg)	Δ (mm) 10^{-2}
50	0.5	1200	14.25	2400	55.5
100	2.5	1250	14.25	2450	74.5
150	3	1300	14.25	2500	74.5
200	4	1350	14.25	2550	77.5
250	5	1400	14.25	2600	82
300	5.5	1450	14.25	2650	85.5
350	6	1500	30.25	2700	94
400	7.5	1550	30.25	2750	94
450	8	1600	30.25	2800	103
500	8.5	1650	30.25	2850	110
550	9	1700	30.25	2900	115
600	9.5	1750	30.25	2950	119.5
650	9.5	1800	30.25	3000	127
700	10	1850	38.8	3050	134
750	10	1900	38.8	3100	148
800	10	1950	41	3150	158
850	11.5	2000	43	3200	168
900	11.5	2050	43.25	3250	180
950	14	2100	45	3300	192
1000	14.25	2150	46	3350	213
1050	14.25	2200	47	3400	229
1100	14.25	2250	49	3450	235
1150	14.25	2300	50		
1150	14.25	2350	52.5		



Gambar Grafik Hubungan Beban – Selip alat sambung Claw Nailplate 8 C 3

**Data Spesifikasi *Claw Nailplate*
yang Digunakan dalam Penelitian**

Seluruh plat yang digunakan merupakan plat baja galvanis dengan ketebalan 1mm dan tinggi paku 8 mm.

Data *Claw NailPlate* pada Pengujian Sambungan Per-Pasang

No	Nama Claw Nail	Jumlah Paku	Kekuatan	
			(KN)	(Kg)
1	2 x 3C1H	36	4,752	484,404
2	2 x 4C3	96	12,672	1291,743
3	2 x 6C3	144	19,008	1937,615
4	2 x 8C3	192	25,344	2583,486

Data *Claw NailPlate* pada Pengujian Kuda-Kuda Papan Per-Pasang

No	Nama Claw Nail	Jumlah Paku	Kekuatan	
			(KN)	(Kg)
1	2 x 6C2	96	12,672	1291,743
2	2 x 6C3	144	19,008	1937,615
3	2 x 6C4	192	25,344	2583,486

Beban Perpaku

Dasar Perencanaan Pembebanan (N / Paku)						
	J4		J3		J2	
Kondisi Basah	Basah	Kering	Basah	Kering	Basah	Kering
Sejajar serat	85	110	100	140	140	175
Tegak lurus serat	60	75	75	100	100	125

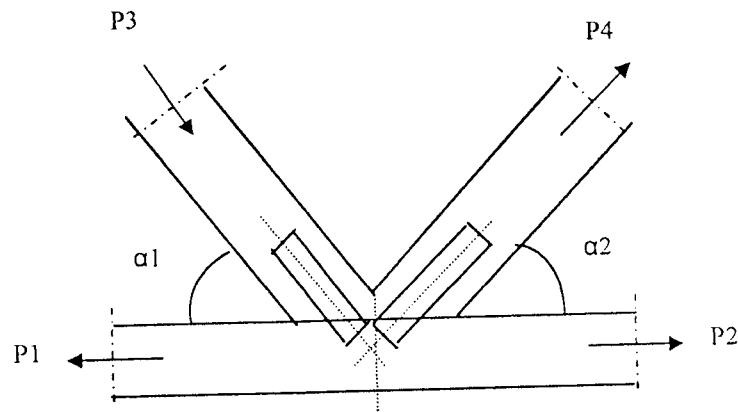
Tabel Kekuatan Baja Claw NailPlate

Beban Ijin Pada Baja (N / mm) / Plat			
Gaya Geser		Gaya Desak	
Memanjang	Menyamping	Memanjang	Menyamping
36	79	137	48

Keterangan:

- J2 : Balau (merah), Kapur, Kempas, Keruing, Merbau / Kliwa
- J3 : Mengkulang, Mersawa, Ramin, Sepetir
- J4 : Meranti (Bakau, Merah tua, Merah muda, Putih, Kuning)

Perencanaan Join Nailplate :



$$\text{Lebar Plat/sisi} = \frac{\text{gaya batang terbesar}}{N_{tp} \times K} \times \frac{1}{2}$$

Untuk batang diagonal dan horizontal:

Menggunakan rumus Hankinson untuk menentukan kekuatan satu paku pada α_n :

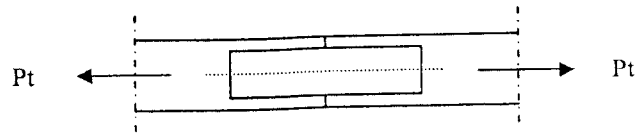
$$N_{\alpha n} = \frac{N_{psejajar} \times N_{ptegak\ lurus}}{N_{psejajar} (\sin \alpha n)^2 + N_{ptegak\ lurus} (\cos \alpha n)^2}$$

$$\text{Jumlah Paku/sisi} = \frac{P_3}{N_{\alpha n} \times K} \times \frac{1}{2}$$

Gaya geser pada joint antara batang diagonal dan batang bawah (α_n):

$$N_{s\alpha n} = \frac{N_s \text{ Longitudinal} \times N_s \text{ Lateral}}{N_s \text{ Longitudinal} (\sin \alpha n)^2 + N_s \text{ Lateral} (\cos \alpha n)^2}$$

$$\text{Gaya geser/sisi} > \frac{P_1 - P_2}{N_{s\alpha n}} \times \frac{1}{2}$$



Paku yang digunakan:

$$\text{Jumlah paku/sisi} > \frac{1,15 \times Pt}{N_p \times K} \times \frac{1}{2}$$

Lebar Plat:

$$\text{Lebar Plat/sisi} > \frac{Pt}{N_{tp} \times K} \times \frac{1}{2}$$

Keterangan:

- P = Gaya batang (N)
- N_{tp} = Kekuatan yang diijinkan pada plat (N/mm)
- K = Faktor lamanya pembebanan (1.0)
- N_p = Perencanaan dasar pembebanan untuk desak (N / Paku)
- N_s = Perencanaan dasar pembebanan untuk geser (N / Paku)
- α = Sudut antara batang diagonal dan horizontal

Perencanaan Beban Rencana Kuda-Kuda Papan dengan Alat

Sambung Claw Nailplate

Beban rencana direncanakan berdasarkan hasil pengujian kuat desak kayu

// serat, dengan tahap pengerjaan sebagai berikut :

Dik : Beban maks 1 (P1) = 2845 kg

Beban maks 2 (P2) = 2800 kg

Beban maks 3 (P3) = 3930 kg

Luas tampang (A) = 9 cm²

Penyelesaian :

$$\sigma = P/A$$

$$\sigma_1 = 2845 / 9 = 316,111 \text{ kg/cm}^2$$

$$\sigma_2 = 2800 / 9 = 311,111 \text{ kg/cm}^2$$

$$\sigma_3 = 3930 / 9 = 436,667 \text{ kg/cm}^2$$

$$\sigma_{\text{rata-rata}} = \frac{316,111 + 311,111 + 436,667}{3} = 354,630 \text{ kg/cm}^2$$

$$I_{\text{min}} = 1/12 \cdot b^3 \cdot h = 1/12 (3^3) (20) = 45 \text{ cm}^4$$

$$i_{\text{min}} = \sqrt{\frac{I_{\text{min}}}{A}} = 0,289b = 0,289 (3) = 0,867 \text{ cm}$$

$$\lambda = \frac{Lk}{i_{\text{min}}} = \frac{20}{0,867} = 23,068$$

Berdasarkan tabel faktor tekuk, Daftar III, PKKI 1961, $\lambda = 23,068$ didapat

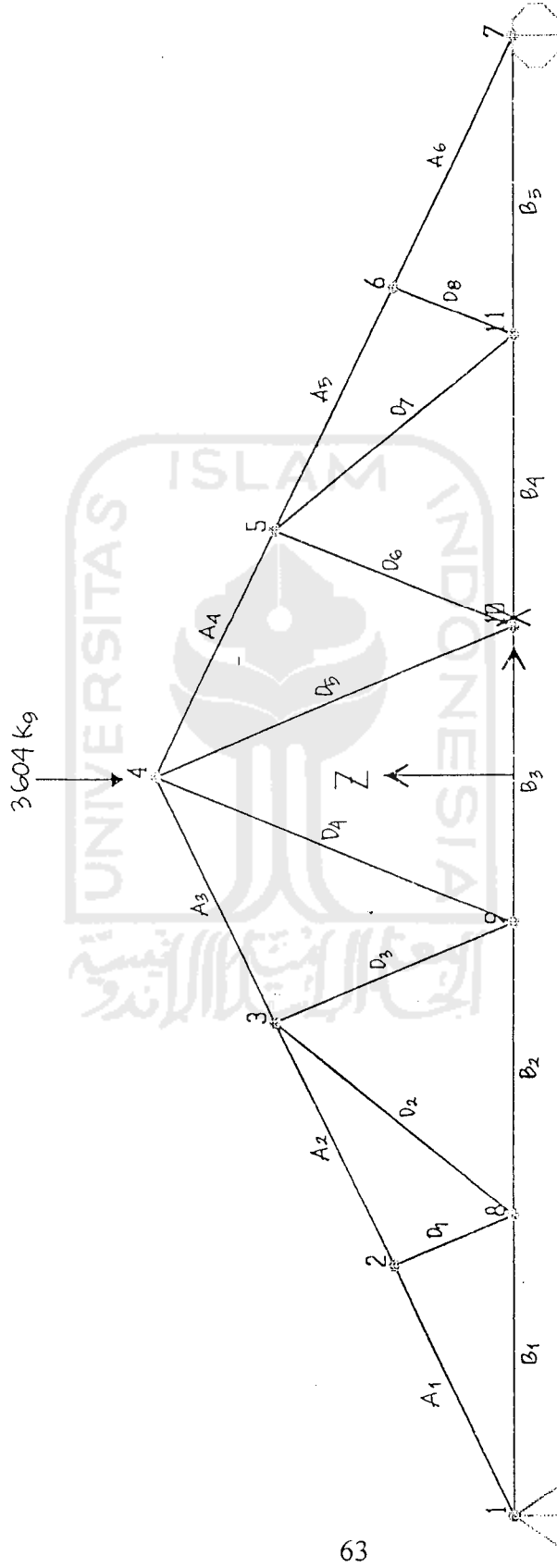
$\omega = 1,181$ maka :

$$\sigma = \frac{P \cdot \omega}{A}$$

$$P = \frac{\sigma \cdot A}{\omega} = \frac{354,630 \times (3 \times 20)}{1,181} = 18016,765 \text{ kg}$$

$$P_{\text{renc}} = \frac{P}{SF} = \frac{18016,765}{5} = 3604 \text{ kg}$$





FRAME ELEMENT FORCES

FRAME	LOAD	LOC	P	V2	V3	T
	M2	M3				
A1	3604KG					
		0.00	-4163.54	-1.763E-01	0.00	0.00
0.00	-8.146E-02					
		9.2E-01	-4163.54	-1.763E-01	0.00	0.00
0.00	8.146E-02					
A2	3604KG					
		0.00	-4163.12	-4.908E-02	0.00	0.00
0.00	-2.268E-02					
		9.2E-01	-4163.12	-4.908E-02	0.00	0.00
0.00	2.268E-02					
A3	3604KG					
		0.00	-4163.51	-6.296E-03	0.00	0.00
0.00	-2.910E-03					
		9.2E-01	-4163.51	-6.296E-03	0.00	0.00
0.00	2.910E-03					
A4	3604KG					
		0.00	-4163.51	6.296E-03	0.00	0.00
0.00	2.910E-03					
		9.2E-01	-4163.51	6.296E-03	0.00	0.00
0.00	-2.910E-03					
A5	3604KG					
		0.00	-4163.12	4.908E-02	0.00	0.00
0.00	2.268E-02					
		9.2E-01	-4163.12	4.908E-02	0.00	0.00
0.00	-2.268E-02					
A6	3604KG					
		0.00	-4163.54	1.763E-01	0.00	0.00
0.00	8.146E-02					
		9.2E-01	-4163.54	1.763E-01	0.00	0.00
0.00	-8.146E-02					
B1	3604KG					
		0.00	3753.46	-1.452E-01	0.00	0.00
0.00	-7.262E-02					
		1.00	3753.46	-1.452E-01	0.00	0.00
0.00	7.262E-02					
B2	3604KG					
		0.00	3753.42	-3.656E-02	0.00	0.00
0.00	-1.828E-02					

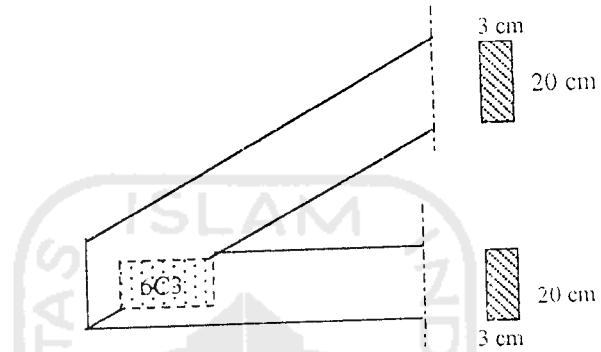
	1.00	3753.42	-3.656E-02	0.00	0.00
0.00	1.828E-02				
B3	3604KG				
	0.00	3753.62	0.00	0.00	0.00
0.00	0.00				
	1.00	3753.62	0.00	0.00	0.00
0.00	0.00				
B4	3604KG				
	0.00	3753.42	3.656E-02	0.00	0.00
0.00	1.828E-02				
	1.0E+00	3753.42	3.656E-02	0.00	0.00
0.00	-1.828E-02				
B5	3604KG				
	0.00	3753.46	1.452E-01	0.00	0.00
0.00	7.262E-02				
	1.0E+00	3753.46	1.452E-01	0.00	0.00
0.00	-7.262E-02				
D1	3604KG				
	0.00	1.508E-01	-4.174E-01	0.00	0.00
0.00	-9.043E-02				
	4.3E-01	1.508E-01	-4.174E-01	0.00	0.00
0.00	9.043E-02				
D2	3604KG				
	0.00	-4.987E-01	-3.948E-02	0.00	0.00
0.00	-2.055E-02				
	1.04	-4.987E-01	-3.948E-02	0.00	0.00
0.00	2.055E-02				
D3	3604KG				
	0.00	2.872E-01	-3.201E-02	0.00	0.00
0.00	-1.387E-02				
	8.7E-01	2.872E-01	-3.201E-02	0.00	0.00
0.00	1.387E-02				
D4	3604KG				
	0.00	-3.386E-01	-3.702E-03	0.00	0.00
0.00	-2.406E-03				
	1.30	-3.386E-01	-3.702E-03	0.00	0.00
0.00	2.406E-03				
D5	3604KG				
	0.00	-3.386E-01	3.702E-03	0.00	0.00
0.00	2.406E-03				
	1.30	-3.386E-01	3.702E-03	0.00	0.00
0.00	-2.406E-03				

D6	3604KG	0.00	2.872E-01	3.201E-02	0.00	0.00
0.00	1.387E-02					
	8.7E-01		2.872E-01	3.201E-02	0.00	0.00
0.00	-1.387E-02					
D7	3604KG	0.00	-4.987E-01	3.948E-02	0.00	0.00
0.00	2.055E-02					
	1.04		-4.987E-01	3.948E-02	0.00	0.00
0.00	-2.055E-02					
D8	3604KG	0.00	1.508E-01	4.174E-01	0.00	0.00
0.00	9.043E-02					
	4.3E-01		1.508E-01	4.174E-01	0.00	0.00
0.00	-9.043E-02					

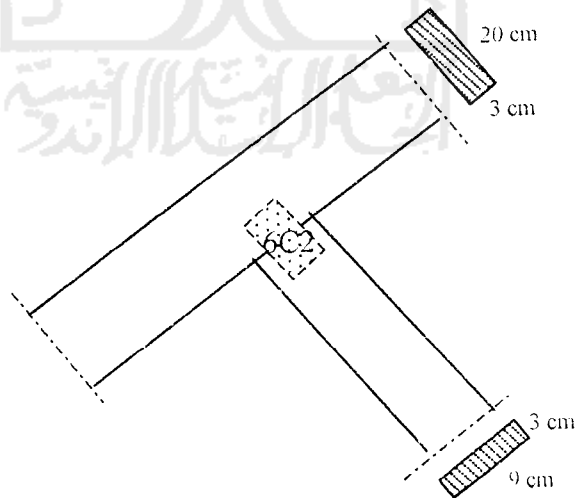


RENCANA PEMASANGAN ALAT SAMBUNG PADA KUDA-KUDA

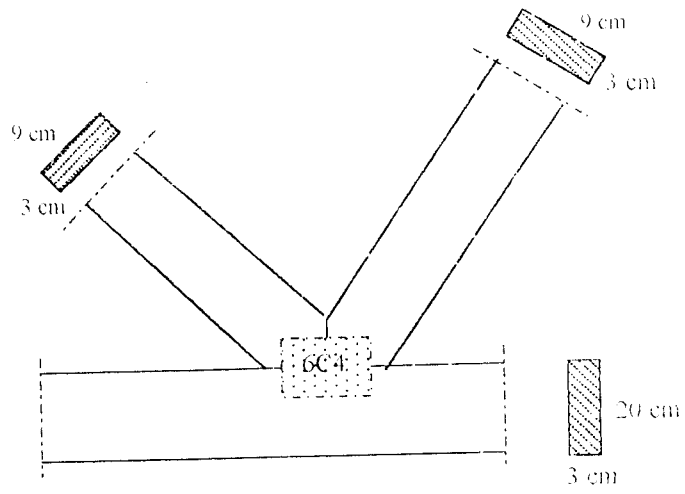
Joint 1



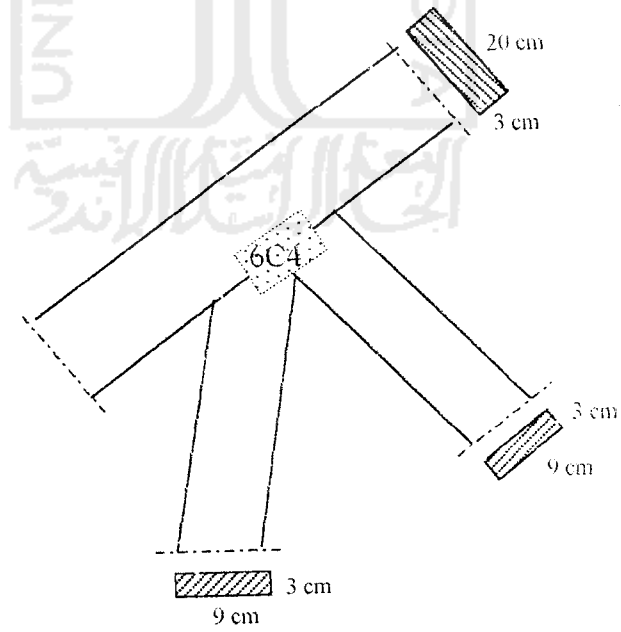
Joint 2



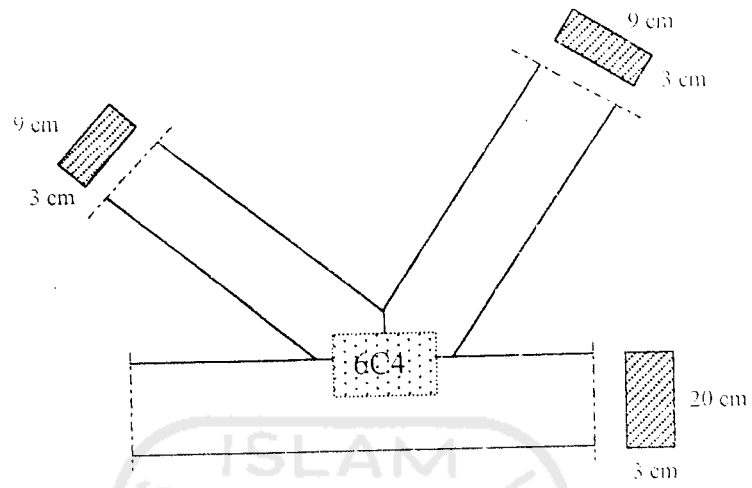
Joint 8



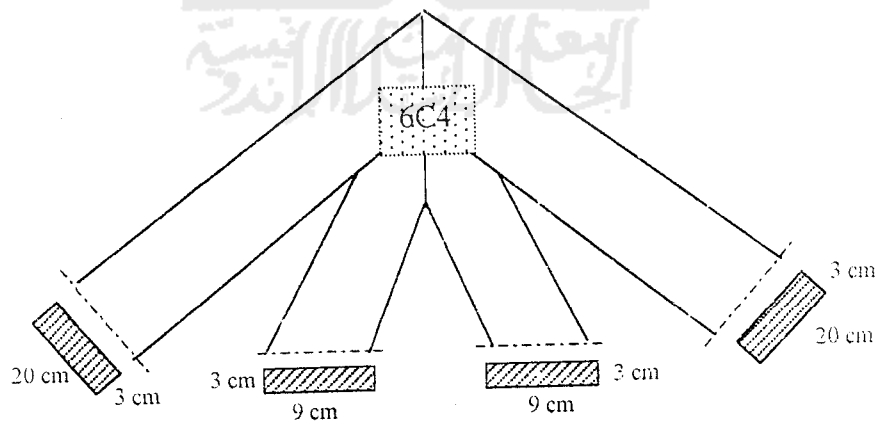
Joint 3



Joint 9

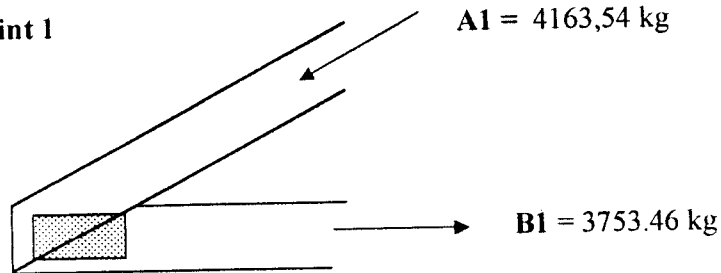


Joint 4



RENCANA PEMASANGAN ALAT SAMBUNG PADA KUDA-KUDA

Joint 1

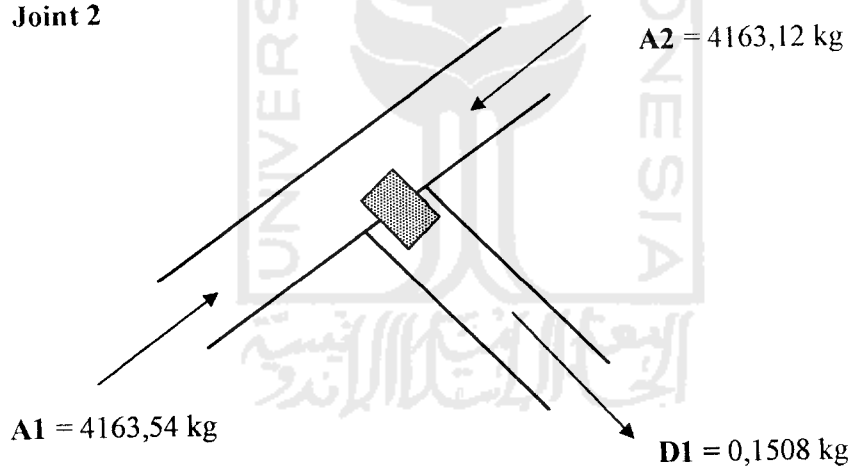


P per paku = 0.132 KN = 13.456 Kg x 15% = 20.184 Kg

Jumlah paku yang dipakai : $\frac{1,15 \times 4163,54}{20,184} \times (1/2) = 118,610$ bh

digunakan 144 bh paku (6C3)

Joint 2

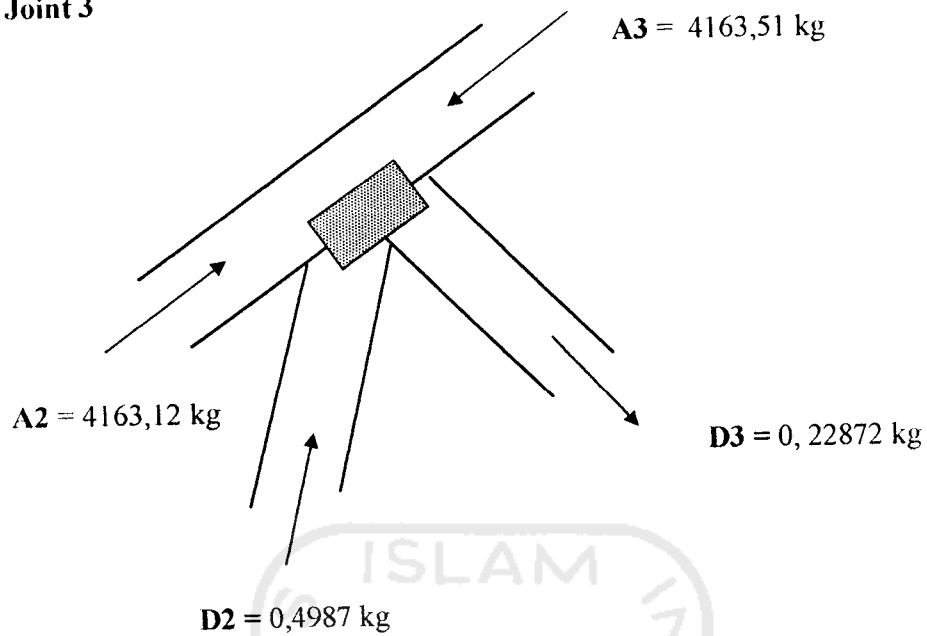


Jumlah paku yang dipakai : $\frac{1,15 \times 4163}{20,184} \times (1/2) = 118,610$ bh

digunakan 144 bh paku (6C3)

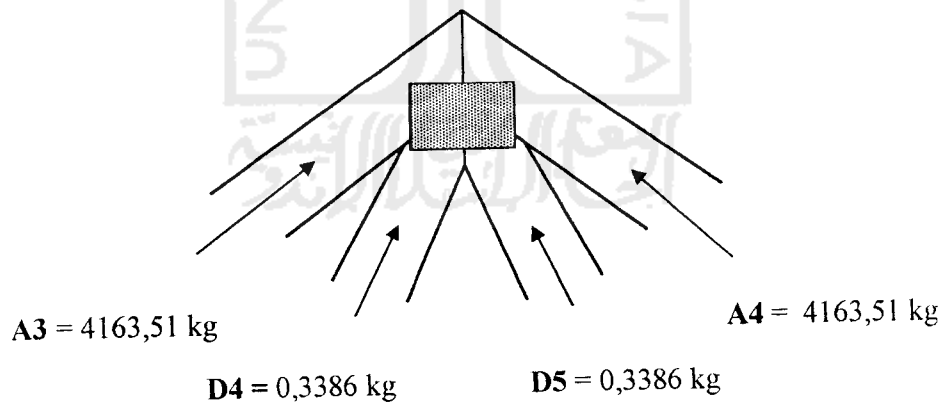
Pada sambungan ini digunakan sambungan 6C2, jika dipakai samb 6C3 dikuatirkan saat pemasangan alat sambung batang diagonal (D1) mengalami kerusakan (pecah), disebabkan lebar batang (D1) = 9 cm

Joint 3



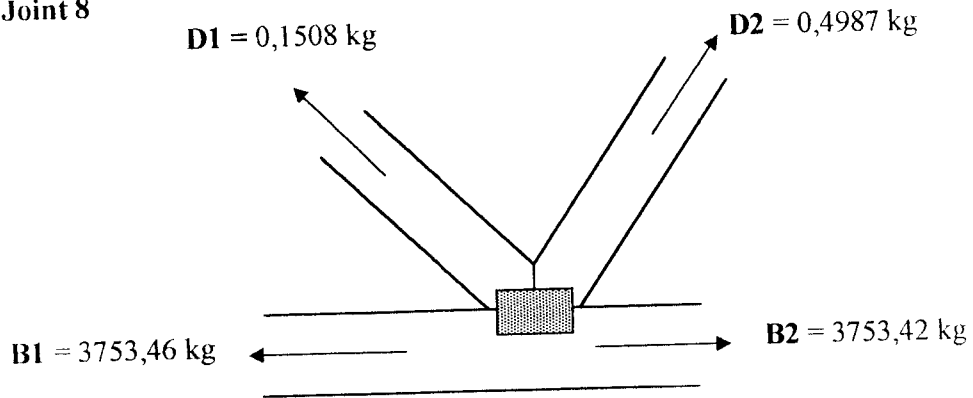
Jumlah paku yang dipakai $\frac{1,15 \times 4163,51}{20,184} \times (\frac{1}{2}) = 118,609 \text{ bh}$
paku yang digunakan 192 (6C4)

Joint 4



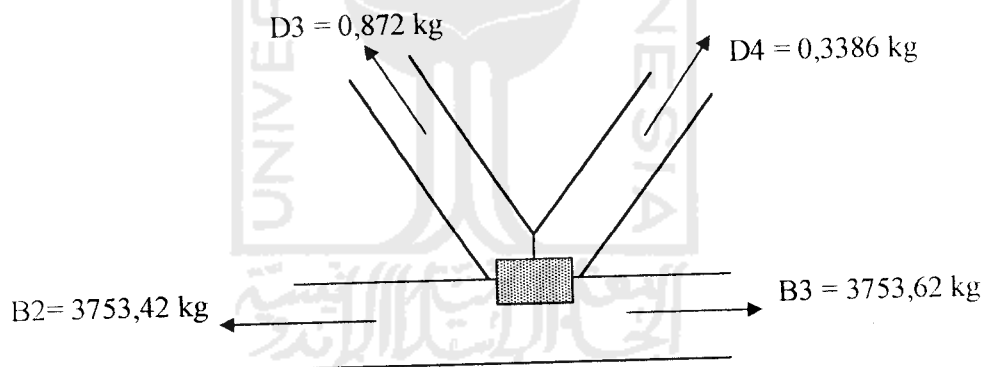
Jumlah paku yang dipakai : $\frac{1,15 \times 4163,51}{20,184} \times (\frac{1}{2}) = 118,609 \text{ bh}$
digunakan 192 bh paku

Joint 8



Jumlah paku yang dipakai : $\frac{1,15 \times 3753,46}{20,184} \times (\frac{1}{2}) = 106,928$ bh
digunakan 192 bh paku (6C4)

Joint 9



Jumlah paku yang dipakai $\frac{1,15 \times 3753,62}{20,184} \times (\frac{1}{2}) = 106,932$ bh
paku yang digunakan 192 (6C4)

Tabel Hasil Pengujian Kuat Lentur pada Benda Uji 1

DIAL 1					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	22	2100	465
2	100	0	23	2200	483
3	200	0	24	2300	505
4	300	11	25	2400	517
5	400	32	26	2500	543
6	500	53	27	2600	573
7	600	104	28	2700	588
8	700	118	29	2800	600
9	800	132	30	2900	613
10	900	152	31	3000	635
11	1000	165	32	3100	668
12	1100	204	33	3200	702
13	1200	244	34	3300	767
14	1300	274	35	3400	784
15	1400	294	36	3500	839
16	1500	332	37	3600	926
17	1600	347	38	3600	1025
18	1700	365	39	3600	1128
19	1800	388	40	3600	1164
20	1900	405	41	3600	1198
21	2000	446	42	3600	1210

DIAL 2					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	22	2100	735
2	100	6.3	23	2200	738
3	200	12	24	2300	768
4	300	17	25	2400	777
5	400	76	26	2500	791
6	500	88	27	2600	807
7	600	167	28	2700	822
8	700	178	29	2800	880
9	800	189	30	2900	883
10	900	201	31	3000	892
11	1000	289	32	3100	915
12	1100	302	33	3200	978
13	1200	390	34	3300	1008.5
14	1300	419	35	3400	1071
15	1400	475	36	3500	1090
16	1500	509	37	3600	1183
17	1600	527	38	3600	1282
18	1700	591	39	3600	1389
19	1800	599	40	3600	1412
20	1900	608	41	3600	1483
21	2000	700	42	3600	1515

DIAL 3					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	22	2100	822.5
2	100	7.25	23	2200	839
3	200	14	24	2300	850
4	300	27.5	25	2400	873.5
5	400	48	26	2500	899.5
6	500	73	27	2600	925
7	600	131.5	28	2700	941
8	700	150.25	29	2800	954
9	800	170	30	2900	967
10	900	206	31	3000	990
11	1000	255	32	3100	1022.5
12	1100	342.5	33	3200	1050
13	1200	429.5	34	3300	1096
14	1300	503	35	3400	1108
15	1400	528.5	36	3500	1149
16	1500	613	37	3600	1208
17	1600	630.5	38	3600	1277.5
18	1700	641	39	3600	1355
19	1800	713.5	40	3600	1387
20	1900	735.5	41	3600	1414
21	2000	803	42	3600	1442.5

DIAL 4					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	22	2100	465
2	100	0	23	2200	493
3	200	0	24	2300	535
4	300	0	25	2400	552
5	400	5	26	2500	595
6	500	19	27	2600	644
7	600	60	28	2700	669
8	700	72	29	2800	688
9	800	85	30	2900	711
10	900	104	31	3000	744
11	1000	112	32	3100	791
12	1100	148	33	3200	833
13	1200	190	34	3300	903
14	1300	222	35	3400	920
15	1400	247	36	3500	970
16	1500	291	37	3600	1061
17	1600	312	38	3600	1159
18	1700	325	39	3600	1252
19	1800	360	40	3600	1288
20	1900	392	41	3600	1321
21	2000	440	42	3600	1364

DIAL 5					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	22	2100	512.5
2	100	7.75	23	2200	537
3	200	15	24	2300	572
4	300	27.5	25	2400	588.5
5	400	49	26	2500	627.5
6	500	67.5	27	2600	669.25
7	600	113.25	28	2700	699.25
8	700	127.8	29	2800	712.5
9	800	142	30	2900	732.5
10	900	160	31	3000	764
11	1000	169	32	3100	806.25
12	1100	207	33	3200	842
13	1200	248	34	3300	907
14	1300	276	35	3400	925
15	1400	303	36	3500	977.5
16	1500	341	37	3600	1065
17	1600	363	38	3600	1197.5
18	1700	374	39	3600	1286
19	1800	407.25	40	3600	1327
20	1900	437.5	41	3600	1367
21	2000	506	42	3600	1412

DIAL 6					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	22	2100	407
2	100	10	23	2200	424
3	200	17.5	24	2300	446
4	300	35.25	25	2400	458
5	400	54.25	26	2500	482.25
6	500	73	27	2600	509
7	600	118	28	2700	520
8	700	130.5	29	2800	538.5
9	800	143	30	2900	551
10	900	157	31	3000	572
11	1000	163.5	32	3100	601
12	1100	190	33	3200	625
13	1200	219	34	3300	670
14	1300	240	35	3400	680
15	1400	260	36	3500	715
16	1500	284	37	3600	771.5
17	1600	300	38	3600	838
18	1700	308	39	3600	908
19	1800	322	40	3600	934
20	1900	353.5	41	3600	958.5
21	2000	382	42	3600	986

Tabel Hasil Pengujian Kuat Lentur pada Benda Uji 2

DIAL 1					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	23	2200	361.5
2	100	5	24	2300	380
3	200	27	25	2400	388
4	300	44	26	2500	400
5	400	52	27	2600	422
6	500	72	28	2700	438
7	600	89	29	2800	451.5
8	700	107	30	2900	462
9	800	132	31	3000	483
10	900	142	32	3100	499
11	1000	159	33	3200	519
12	1100	182	34	3300	540
13	1200	194	35	3400	555.5
14	1300	206.5	36	3500	581
15	1400	220.5	37	3600	624
16	1500	239	38	3700	654
17	1600	265	39	3800	692
18	1700	281	40	3900	740
19	1800	300	41	4000	882
20	1900	306	42	4000	989
21	2000	318.5	43	4000	1089
22	2100	348.5	44	4000	1172

DIAL 2					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	23	2200	382
2	100	12	24	2300	400
3	200	39	25	2400	408
4	300	52	26	2500	420
5	400	55	27	2600	445
6	500	63	28	2700	460
7	600	81	29	2800	477
8	700	97	30	2900	485
9	800	123	31	3000	510
10	900	133	32	3100	527
11	1000	152	33	3200	549
12	1100	177	34	3300	571
13	1200	192	35	3400	589
14	1300	206	36	3500	626
15	1400	221	37	3600	666
16	1500	242	38	3700	705
17	1600	273	39	3800	743
18	1700	289	40	3900	807
19	1800	310	41	4000	921
20	1900	320	42	4000	1098
21	2000	335	43	4000	1158
22	2100	366	44	4000	1277

DIAL 3					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	23	2200	330
2	100	6	24	2300	345.5
3	200	22	25	2400	352.5
4	300	37	26	2500	363
5	400	43.5	27	2600	384
6	500	59	28	2700	397
7	600	73	29	2800	409.5
8	700	87	30	2900	418.5
9	800	108.5	31	3000	437
10	900	116	32	3100	451
11	1000	130	33	3200	470
12	1100	151	34	3300	487
13	1200	164	35	3400	502.5
14	1300	170	36	3500	534
15	1400	188.5	37	3600	566
16	1500	206	38	3700	604.5
17	1600	234.5	39	3800	628
18	1700	250.5	40	3900	674
19	1800	268	41	4000	743
20	1900	276	42	4000	804.5
21	2000	290.5	43	4000	882.5
22	2100	318	44	4000	947

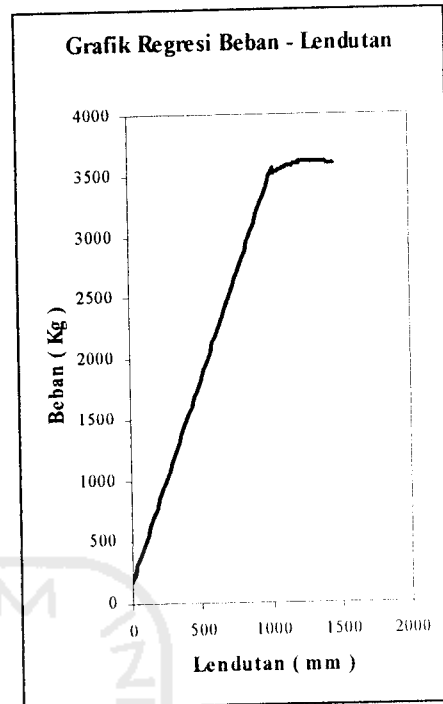
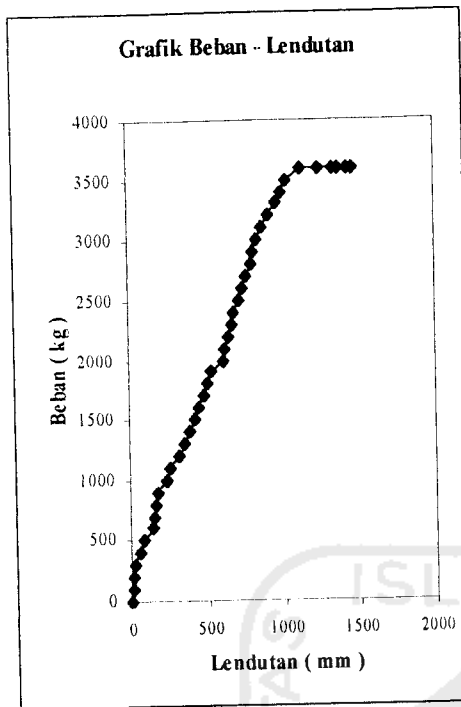
DIAL 4					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	23	2200	308
2	100	0	24	2300	325
3	200	13.5	25	2400	333
4	300	25	26	2500	344.5
5	400	38.5	27	2600	368
6	500	56	28	2700	384
7	600	71	29	2800	399
8	700	86	30	2900	408
9	800	108	31	3000	430
10	900	115	32	3100	447
11	1000	130	33	3200	469
12	1100	150	34	3300	495
13	1200	161	35	3400	518
14	1300	172	36	3500	530
15	1400	183.5	37	3600	635
16	1500	199.5	38	3700	683
17	1600	225	39	3800	733
18	1700	236	40	3900	798
19	1800	250	41	4000	935
20	1900	259	42	4000	1040
21	2000	269	43	4000	1144
22	2100	296	44	4000	1235

DIAL 5					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	23	2200	316
2	100	5	24	2300	332
3	200	22	25	2400	339
4	300	38	26	2500	370
5	400	55	27	2600	392
6	500	75	28	2700	405
7	600	88	29	2800	438
8	700	101	30	2900	472
9	800	123	31	3000	472
10	900	131	32	3100	491
11	1000	150	33	3200	525
12	1100	171	34	3300	551
13	1200	183	35	3400	570
14	1300	194	36	3500	602
15	1400	204.5	37	3600	671
16	1500	218	38	3700	716.5
17	1600	239	39	3800	765
18	1700	251	40	3900	819
19	1800	265	41	4000	927
20	1900	271	42	4000	1044
21	2000	281	43	4000	1181
22	2100	305	44	4000	1423

DIAL 6					
No	P (kg)	ΔL (mm)	No	P (kg)	ΔL (mm)
1	0	0	23	2200	321
2	100	5.5	24	2300	336.5
3	200	28.5	25	2400	343
4	300	48	26	2500	353
5	400	55	27	2600	373
6	500	74	28	2700	387.5
7	600	90	29	2800	399
8	700	106.5	30	2900	406.5
9	800	130.5	31	3000	423
10	900	138	32	3100	436
11	1000	153	33	3200	455
12	1100	172	34	3300	473
13	1200	184	35	3400	487
14	1300	195	36	3500	508
15	1400	207	37	3600	549
16	1500	223	38	3700	578
17	1600	245.5	39	3800	607.5
18	1700	258.5	40	3900	644
19	1800	272	41	4000	714
20	1900	278	42	4000	784
21	2000	288.5	43	4000	862
22	2100	310	44	4000	924.5

Tabel Hasil Pembacaan Dial Beban – Lendutan Benda Uji 1

BEBAN (Kg)	Dial (x 0.01) mm		
	A (1,4) rata-rata	B (2,5) rata-rata	C (3,6) rata-rata
0	0	0	0
100	0	7.025	8.5125
200	0	13.5	15.5
300	5.5	22.25	28.75
400	18.5	62.5	58.375
500	36	77.75	75.375
600	82	140.125	129.0625
700	95	152.9	141.7
800	108.5	165.5	154.25
900	128	180.5	168.75
1000	138.5	229	196.25
1100	176	254.5	222.25
1200	217	319	269
1300	248	347.5	293.75
1400	270.5	389	324.5
1500	311.5	425	354.5
1600	329.5	445	372.5
1700	345	482.5	395.25
1800	374	503.125	412.5625
1900	398.5	522.75	438.125
2000	443	603	492.5
2100	465	623.75	515.375
2200	488	637.5	530.75
2300	520	670	558
2400	534.5	682.75	570.375
2500	569	709.25	595.75
2600	608.5	738.125	623.5625
2700	628.5	760.625	640.3125
2800	644	796.25	667.375
2900	662	807.75	679.375
3000	689.5	828	700
3100	729.5	860.625	730.8125
3200	767.5	910	767.5
3300	835	957.75	813.875
3400	852	998	839
3500	904.5	1033.75	874.375
3600	993.5	1124	989.75
3600	1092	1239.75	1057.75
3600	1190	1337.5	1131.5
3600	1226	1369.5	1160.5
3600	1259.5	1425	1186.25
3600	1237	1463.5	1214.25

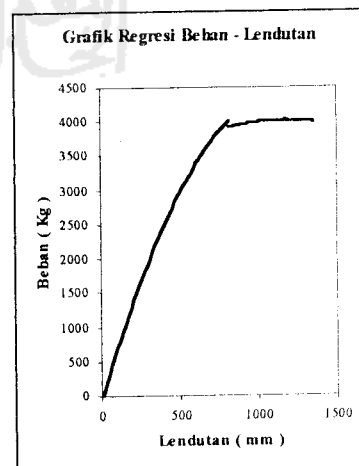
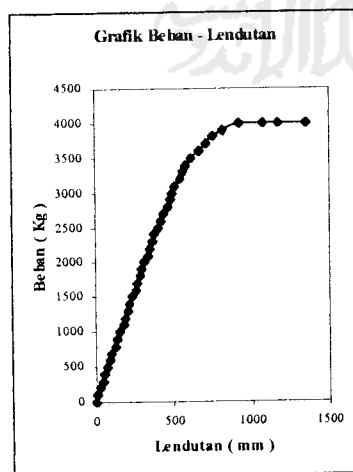


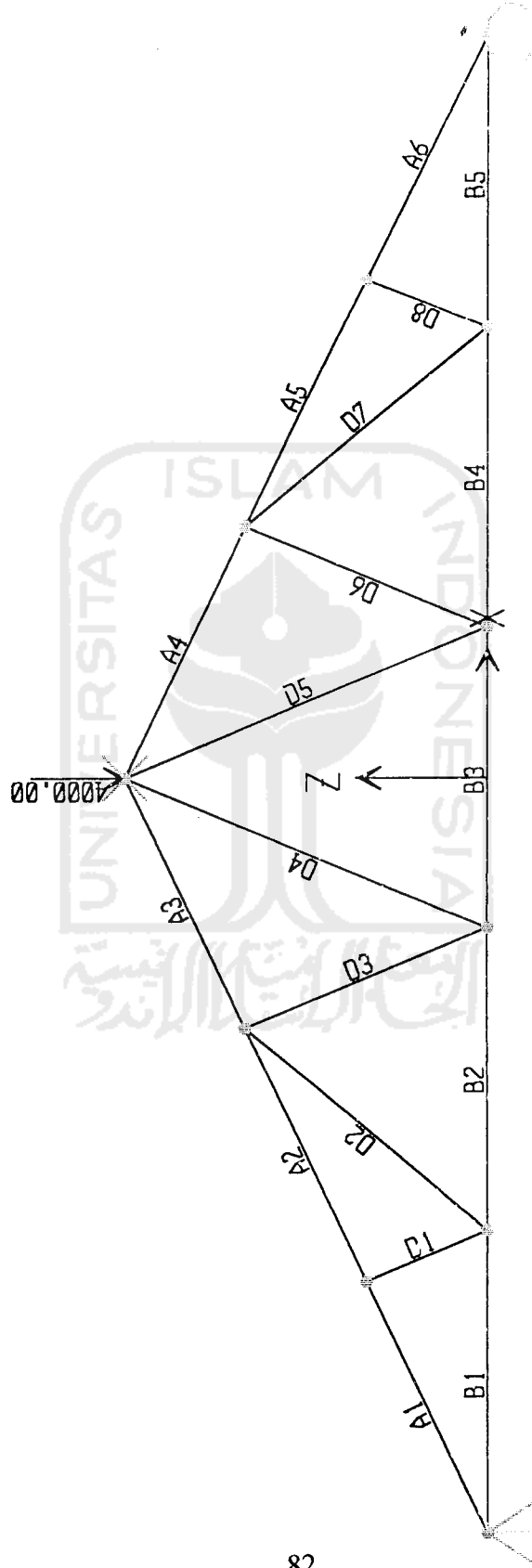
Tabel Hasil Pembacaan Dial Beban – Lendutan Benda Uji 2

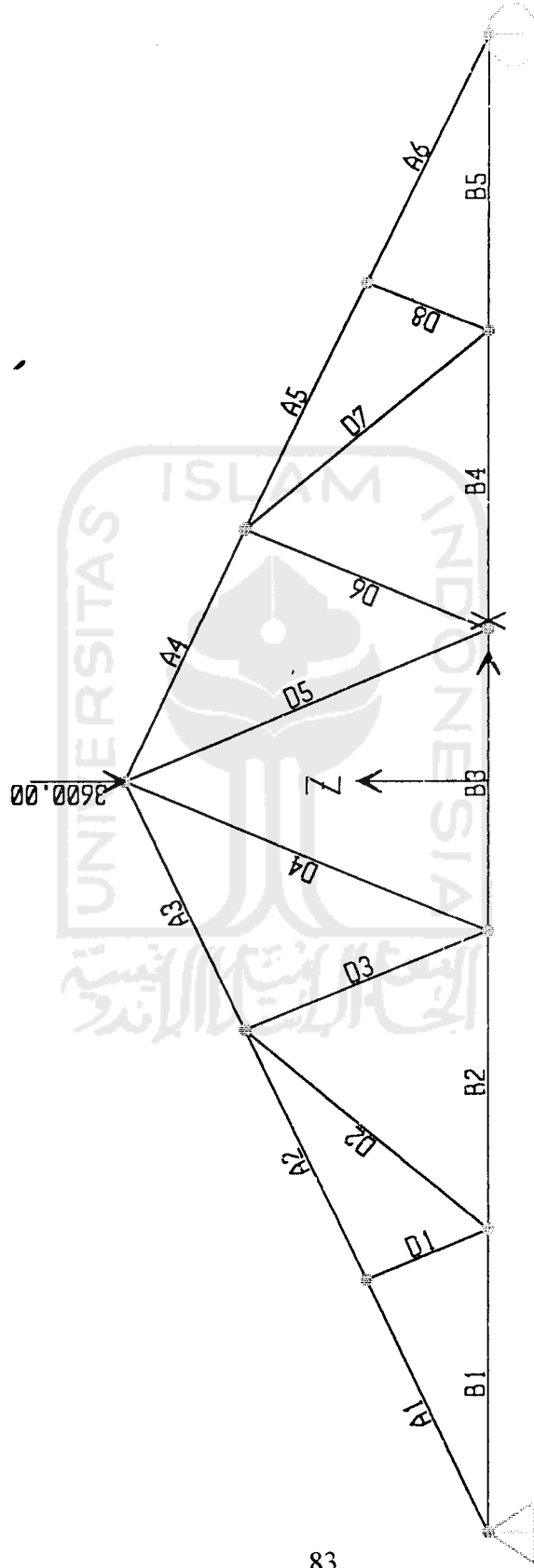
BEBAN (Kg)	Dial (x 0.01) mm		
	A (1,4) rata-rata	B (2 , 5) rata-rata	C (3 , 6) rata-rata
0	0	0	0
100	2.5	8.5	5.75
200	20.25	30.5	25.25
300	34.5	45	42.5
400	45.25	55	49.25
500	64	69	66.5
600	80	84.5	81.5
700	96.5	99	96.75
800	120	123	119.5
900	128.5	132	127
1000	144.5	151	141.5
1100	166	174	161.5
1200	177.5	187.5	174
1300	189.25	200	182.5
1400	202	212.75	197.75
1500	219.25	230	214.5
1600	245	256	240
1700	258.5	270	254.5

Lanjutan Hasil Pembacaan Dial Beban – Lendutan Benda Uji 2

BEBAN (Kg)	Dial (x 0.01) mm		
	A (1,4) rata-rata	B (2 , 5) rata-rata	C (2 , 5) rata-rata
1800	275	287.5	270
1900	282.5	295.5	277
2000	293.75	308	289.5
2100	322.25	335.5	314
2200	334.75	349	325.5
2300	352.5	366	341
2400	360.5	373.5	347.75
2500	372.25	395	358
2600	395	418.5	378.5
2700	411	432.5	392.25
2800	425.25	457.5	404.25
2900	435	478.5	412.5
3000	456.5	491	430
3100	473	509	443.5
3200	494	537	462.5
3300	518	561	480
3400	536.75	579.5	494.75
3500	555.5	614	521
3600	629.5	668.5	557.5
3700	668.5	710.75	591.25
3800	712.5	754	617.75
3900	769	813	659
4000	908.5	924	728.5
4000	1014.5	1071	794.25
4000	1116.5	1169.5	872.25
4000	1203.5	1350	935.75







Batang	Gaya Batang		
	3600 Kg	4000 Kg	Rata-rata
A1	- 4158.9240	- 4621.0270	- 4389.9755
A2	- 4158.5000	- 4620.5550	- 4389.5275
A3	- 4158.8890	- 4620.9880	- 4389.9385
A4	- 4158.8890	- 4620.9880	- 4389.9385
A5	- 4158.5000	- 4620.5550	- 4389.5275
A6	- 4158.9240	- 4621.0270	- 4389.9755
B1	3749.2890	4165.8770	3957.5830
B2	3749.2510	4165.8340	3957.5425
B3	3749.4580	4166.0650	3957.7615
B4	3749.2510	4165.8340	3957.5425
B5	3749.2890	4165.8770	3957.5830
D1	0.1506	0.1673	0.1590
D2	- 0.4981	- 0.5535	- 0.5258
D3	0.2869	0.3188	0.3028
D4	- 0.3382	- 0.3758	- 0.3570
D5	- 0.3382	- 0.3758	- 0.3570
D6	0.2869	0.3188	0.3028
D7	- 0.4981	- 0.5535	- 0.5258
D8	0.1506	0.1673	0.1590

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UII - Statistic

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

JOINT	LOAD	U1	U2	U3	R1	R2	R3
1	3600KG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	4000KG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	3600KG	19.5276	0.0000	-96.2051	0.0000	0.0000	0.0000
2	4000KG	21.6974	0.0000	-106.8945	0.0000	0.0000	0.0000
3	3600KG	39.0553	0.0000	0.0000	0.0000	0.0000	0.0000
3	4000KG	43.3948	0.0000	0.0000	0.0000	0.0000	0.0000
4	3600KG	24.1216	0.0000	-68.7614	0.0000	0.0000	0.0000
4	4000KG	26.8017	0.0000	-76.4016	0.0000	0.0000	0.0000
5	3600KG	25.6283	0.0000	-90.4068	0.0000	0.0000	0.0000
5	4000KG	28.4759	0.0000	-100.4520	0.0000	0.0000	0.0000
6	3600KG	13.4270	0.0000	-90.4068	0.0000	0.0000	0.0000
6	4000KG	14.9188	0.0000	-100.4520	0.0000	0.0000	0.0000
7	3600KG	14.9337	0.0000	-68.7614	0.0000	0.0000	0.0000
7	4000KG	16.5930	0.0000	-76.4016	0.0000	0.0000	0.0000
8	3600KG	7.8110	0.0000	-75.5576	0.0000	0.0000	0.0000
8	4000KG	8.6789	0.0000	-83.9529	0.0000	0.0000	0.0000
9	3600KG	15.6220	0.0000	-94.5767	0.0000	0.0000	0.0000
9	4000KG	17.3577	0.0000	-105.0852	0.0000	0.0000	0.0000
10	3600KG	23.4333	0.0000	-94.5767	0.0000	0.0000	0.0000
10	4000KG	26.0370	0.0000	-105.0852	0.0000	0.0000	0.0000
11	3600KG	31.2443	0.0000	-75.5576	0.0000	0.0000	0.0000
11	4000KG	34.7159	0.0000	-83.9529	0.0000	0.0000	0.0000

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UII - Statistic

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

JOINT	LOAD	F1	F2	F3	M1	M2	M3
1	3600KG	0.0000	0.0000	1800.0000	0.0000	0.0000	0.0000
1	4000KG	0.0000	0.0000	2000.0000	0.0000	0.0000	0.0000
3	3600KG	0.0000	0.0000	1800.0000	0.0000	0.0000	0.0000
3	4000KG	0.0000	0.0000	2000.0000	0.0000	0.0000	0.0000

SAP2000 v7.42 File: TA Kgf-m Units PAGE 3
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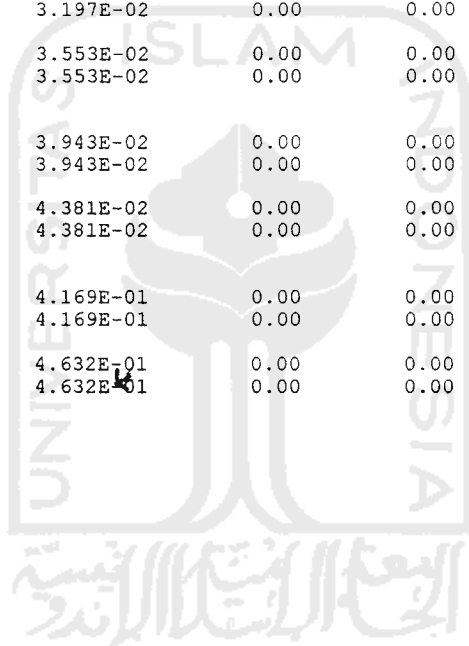
UII - Statistic

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

FRAME	LOAD	LOC	P	V2	V3	T	M2	M3
A1	3600KG	0.00	-4158.92	-1.761E-01	0.00	0.00	0.00	-8.137E-02
		9.2E-01	-4158.92	-1.761E-01	0.00	0.00	0.00	8.137E-02
A1	4000KG	0.00	-4621.03	-1.956E-01	0.00	0.00	0.00	-9.042E-02
		9.2E-01	-4621.03	-1.956E-01	0.00	0.00	0.00	9.042E-02
A2	3600KG							

		0.00	-4158.50	-4.902E-02	0.00	0.00	0.00	-2.266E-02
		9.2E-01	-4158.50	-4.902E-02	0.00	0.00	0.00	2.266E-02
A2	3600KG	0.00	-4620.56	-5.447E-02	0.00	0.00	0.00	-2.517E-02
		9.2E-01	-4620.56	-5.447E-02	0.00	0.00	0.00	2.517E-02
A3	3600KG	0.00	-4158.89	-6.289E-03	0.00	0.00	0.00	-2.907E-03
		9.2E-01	-4158.89	-6.289E-03	0.00	0.00	0.00	2.907E-03
A3	4000KG	0.00	-4620.99	-6.988E-03	0.00	0.00	0.00	-3.230E-03
		9.2E-01	-4620.99	-6.988E-03	0.00	0.00	0.00	3.230E-03
A4	3600KG	0.00	-4158.89	6.289E-03	0.00	0.00	0.00	2.907E-03
		9.2E-01	-4158.89	6.289E-03	0.00	0.00	0.00	-2.907E-03
A4	4000KG	0.00	-4620.99	6.988E-03	0.00	0.00	0.00	3.230E-03
		9.2E-01	-4620.99	6.988E-03	0.00	0.00	0.00	-3.230E-03
A5	3600KG	0.00	-4158.50	4.902E-02	0.00	0.00	0.00	2.266E-02
		9.2E-01	-4158.50	4.902E-02	0.00	0.00	0.00	-2.266E-02
A5	4000KG	0.00	-4620.56	5.447E-02	0.00	0.00	0.00	2.517E-02
		9.2E-01	-4620.56	5.447E-02	0.00	0.00	0.00	-2.517E-02
A6	3600KG	0.00	-4158.92	1.761E-01	0.00	0.00	0.00	8.137E-02
		9.2E-01	-4158.92	1.761E-01	0.00	0.00	0.00	-8.137E-02
A6	4000KG	0.00	-4621.03	1.956E-01	0.00	0.00	0.00	9.042E-02
		9.2E-01	-4621.03	1.956E-01	0.00	0.00	0.00	-9.042E-02
B1	3600KG	0.00	3749.29	-1.451E-01	0.00	0.00	0.00	-7.253E-02
		1.00	3749.29	-1.451E-01	0.00	0.00	0.00	7.253E-02
B1	4000KG	0.00	4165.88	-1.612E-01	0.00	0.00	0.00	-8.059E-02
		1.00	4165.88	-1.612E-01	0.00	0.00	0.00	8.059E-02
B2	3600KG	0.00	3749.25	-3.652E-02	0.00	0.00	0.00	-1.826E-02
		1.00	3749.25	-3.652E-02	0.00	0.00	0.00	1.826E-02
B2	4000KG	0.00	4165.83	-4.057E-02	0.00	0.00	0.00	-2.029E-02
		1.00	4165.83	-4.057E-02	0.00	0.00	0.00	2.029E-02
B3	3600KG	0.00	3749.46	0.00	0.00	0.00	0.00	0.00
		1.00	3749.46	0.00	0.00	0.00	0.00	0.00
B3	4000KG	0.00	4166.06	0.00	0.00	0.00	0.00	0.00
		1.00	4166.06	0.00	0.00	0.00	0.00	0.00
B4	3600KG	0.00	3749.25	3.652E-02	0.00	0.00	0.00	1.826E-02
		1.0E+00	3749.25	3.652E-02	0.00	0.00	0.00	-1.826E-02
B4	4000KG	0.00	4165.83	4.057E-02	0.00	0.00	0.00	2.029E-02
		1.0E+00	4165.83	4.057E-02	0.00	0.00	0.00	-2.029E-02
B5	3600KG	0.00	3749.29	1.451E-01	0.00	0.00	0.00	7.253E-02
		1.0E+00	3749.29	1.451E-01	0.00	0.00	0.00	-7.253E-02
B5	4000KG	0.00	4165.88	1.612E-01	0.00	0.00	0.00	8.059E-02
		1.0E+00	4165.88	1.612E-01	0.00	0.00	0.00	-8.059E-02
D1	3600KG	0.00	1.506E-01	-4.169E-01	0.00	0.00	0.00	-9.033E-02
		4.3E-01	1.506E-01	-4.169E-01	0.00	0.00	0.00	9.033E-02
D1	4000KG	0.00	1.673E-01	-4.632E-01	0.00	0.00	0.00	-1.004E-01
		4.3E-01	1.673E-01	-4.632E-01	0.00	0.00	0.00	1.004E-01
D2	3600KG	0.00	-4.981E-01	-3.943E-02	0.00	0.00	0.00	-2.053E-02
		1.04	-4.981E-01	-3.943E-02	0.00	0.00	0.00	2.053E-02
D2	4000KG							

		0.00	-5.535E-01	-4.381E-02	0.00	0.00	0.00	-2.281E-02
		1.04	-5.535E-01	-4.381E-02	0.00	0.00	0.00	2.281E-02
D3	3600KG	0.00	2.869E-01	-3.197E-02	0.00	0.00	0.00	-1.386E-02
		8.7E-01	2.869E-01	-3.197E-02	0.00	0.00	0.00	1.386E-02
D3	4000KG	0.00	3.188E-01	-3.553E-02	0.00	0.00	0.00	-1.539E-02
		8.7E-01	3.188E-01	-3.553E-02	0.00	0.00	0.00	1.539E-02
D4	3600KG	0.00	-3.382E-01	-3.698E-03	0.00	0.00	0.00	-2.404E-03
		1.30	-3.382E-01	-3.698E-03	0.00	0.00	0.00	2.404E-03
D4	4000KG	0.00	-3.758E-01	-4.109E-03	0.00	0.00	0.00	-2.671E-03
		1.30	-3.758E-01	-4.109E-03	0.00	0.00	0.00	2.671E-03
D5	3600KG	0.00	-3.382E-01	3.698E-03	0.00	0.00	0.00	2.404E-03
		1.30	-3.382E-01	3.698E-03	0.00	0.00	0.00	-2.404E-03
D5	4000KG	0.00	-3.758E-01	4.109E-03	0.00	0.00	0.00	2.671E-03
		1.30	-3.758E-01	4.109E-03	0.00	0.00	0.00	-2.671E-03
D6	3600KG	0.00	2.869E-01	3.197E-02	0.00	0.00	0.00	1.386E-02
		8.7E-01	2.869E-01	3.197E-02	0.00	0.00	0.00	-1.386E-02
D6	4000KG	0.00	3.188E-01	3.553E-02	0.00	0.00	0.00	1.539E-02
		8.7E-01	3.188E-01	3.553E-02	0.00	0.00	0.00	-1.539E-02
D7	3600KG	0.00	-4.981E-01	3.943E-02	0.00	0.00	0.00	2.053E-02
		1.04	-4.981E-01	3.943E-02	0.00	0.00	0.00	-2.053E-02
D7	4000KG	0.00	-5.535E-01	4.381E-02	0.00	0.00	0.00	2.281E-02
		1.04	-5.535E-01	4.381E-02	0.00	0.00	0.00	-2.281E-02
D8	3600KG	0.00	1.506E-01	4.169E-01	0.00	0.00	0.00	9.033E-02
		4.3E-01	1.506E-01	4.169E-01	0.00	0.00	0.00	-9.033E-02
D8	4000KG	0.00	1.673E-01	4.632E-01	0.00	0.00	0.00	1.004E-01
		4.3E-01	1.673E-01	4.632E-01	0.00	0.00	0.00	-1.004E-01



4

**Tabel 5.10 Perbandingan antara Gaya Batang dengan Pcr dan
Kekuatan Sambungan pada Pmaks = 3800 kg**

Batang	Gaya Batang (Kg)	Pcr (Kg)	Nama Claw Nail	Kekuatan Sambungan (Kg)	Keterangan
A1 = A6	- 4389.975	4386.491	2 x 6 C 3	1937.615	Rusak pada batang dan sambungan
A2 = A5	- 4389.527	4386.491	2 x 6 C 4	2583.486	Rusak pada batang dan sambungan
A3 = A4	- 4389.938	4386.491	2 x 6 C 4	2583.486	Rusak pada batang dan sambungan
B1 = B5	3957.583	40623.571	2 x 6 C 4	2583.486	Rusak pada sambungan
B2 = B4	3957.543	40623.571	2 x 6 C 4	2583.486	Rusak pada sambungan
B3	3957.762	40623.571	2 x 6 C 4	2583.486	Rusak pada sambungan
D1 = D8	0.159	18280.607	2 x 6 C 2	1291.743	Aman pada batang dan sambungan
D2 = D7	- 0.5258	1775.343	2 x 6 C 4	2583.486	Aman pada batang dan sambungan
D3 = D6	0.3028	18280.607	2 x 6 C 4	2583.486	Aman pada batang dan sambungan
D4 = D5	- 0.357	1256.598	2 x 6 C 4	2583.486	Aman pada batang dan sambungan

Perhitungan :

1. Batang atas (A)

$$L = 90 \text{ cm} ; b = 3 \text{ cm} ; h = 20 \text{ cm} ; E = 80000 \text{ kg/cm}^2$$

Berdasarkan PKKI 1961:

$$I_{\min} = \frac{1}{12} b^3 h = \frac{1}{12} (3)^3 (20) = 45 \text{ cm}^4$$

$$A = b \times h = 3 \times 20 = 60 \text{ cm}^2$$

$$i_{\min} = \sqrt{\frac{I_{\min}}{A}} = \sqrt{\frac{45}{60}} = 0,866 \text{ cm}$$

$$\lambda = \frac{L}{i_{\min}} = \frac{90}{0,866} = 103,923 > 100 \text{ (rumus Euler)}$$

$$P_{cr} = \frac{\pi^2 EI}{L^2} = \frac{\pi^2 (80000)(45)}{90^2} = 4389,975 \text{ kg}$$

2. Batang bawah (B)

$$b = 3 \text{ cm} ; h = 20 \text{ cm} ; \sigma_{tr} = 796.5406 \text{ kg/cm}^2$$

$A_n = 0,85 \times b \times h \rightarrow$ diambil nilai perlemahan tampang akibat alat sambung paku sebesar 15 %.

$$A_n = 0,85 \times 3 \times 20 = 51 \text{ cm}^2$$

$$P_{tr} = \sigma_{tr} \times A_n = 796.5406 \times 51 = 40623.571 \text{ kg}$$

3. Batang Diagonal D1 = D3 = D6 = D8

$$b = 3 \text{ cm} ; h = 9 \text{ cm} ; \sigma_{tr} = 796.5406 \text{ kg/cm}^2$$

$A_n = 0,85 \times b \times h \rightarrow$ diambil nilai perlemahan tampang akibat alat sambung paku sebesar 15 %.

$$A_n = 0,85 \times 3 \times 9 = 22,95 \text{ cm}^2$$

$$P_{tr} = \sigma_{tr} \times A_n = 796.5406 \times 22,95 = 18280.607 \text{ kg}$$

4. Batang D2 = D7

$$L = 94,9 \text{ cm} ; b = 3 \text{ cm} ; h = 9 \text{ cm} ; E = 80000 \text{ kg/cm}^2$$

Berdasarkan PKKI 1961:

$$I_{\min} = \frac{1}{12} b^3 h = \frac{1}{12} (3)^3 (9) = 20,25 \text{ cm}^4$$

$$A = b \times h = 3 \times 9 = 27 \text{ cm}^2$$

$$i_{\min} = \sqrt{\frac{I_{\min}}{A}} = \sqrt{\frac{20,25}{27}} = 0,866 \text{ cm}$$

$$\lambda = \frac{L}{i_{\min}} = \frac{94,9}{0,866} = 109,584 > 100 \text{ (rumus Euler)}$$

$$P_{cr} = \frac{\pi^2 EI}{L^2} = \frac{\pi^2 (80000)(20,25)}{94,9^2} = 1775.343 \text{ kg}$$

5. Batang D4 = D5

$$L = 112,8 \text{ cm} ; b = 3 \text{ cm} ; h = 9 \text{ cm} ; E = 80000 \text{ kg/cm}^2$$

Berdasarkan PKKI 1961:

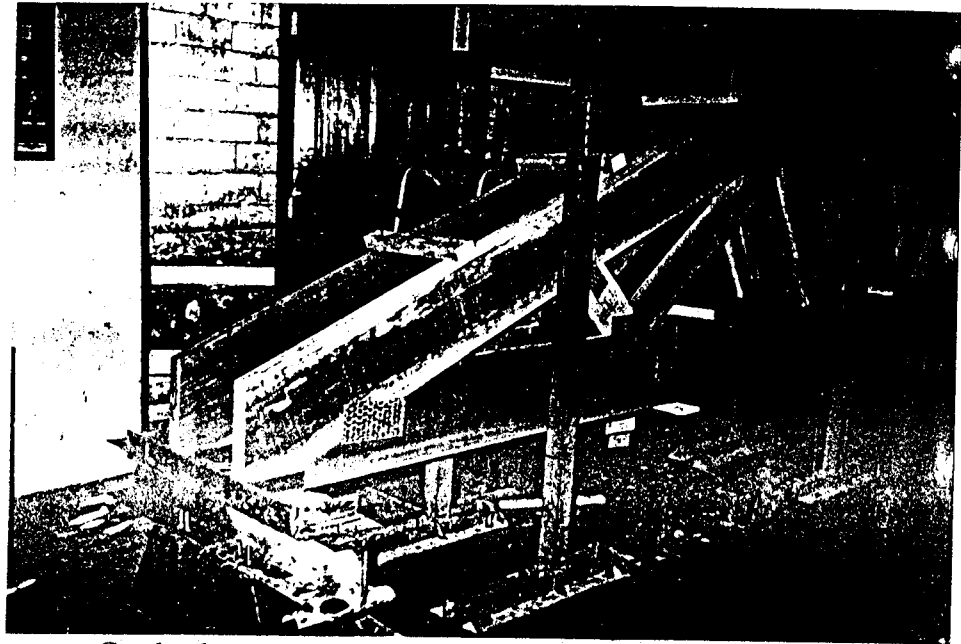
$$I_{\min} = \frac{1}{12} b^3 h = \frac{1}{12} (3)^3 (9) = 20,25 \text{ cm}^4$$

$$A = b \times h = 3 \times 9 = 27 \text{ cm}^2$$

$$i_{\min} = \sqrt{\frac{I_{\min}}{A}} = \sqrt{\frac{20,25}{27}} = 0,866 \text{ cm}$$

$$\lambda = \frac{L}{i_{\min}} = \frac{112,8}{0,866} = 130,254 > 100 \text{ (rumus Euler)}$$

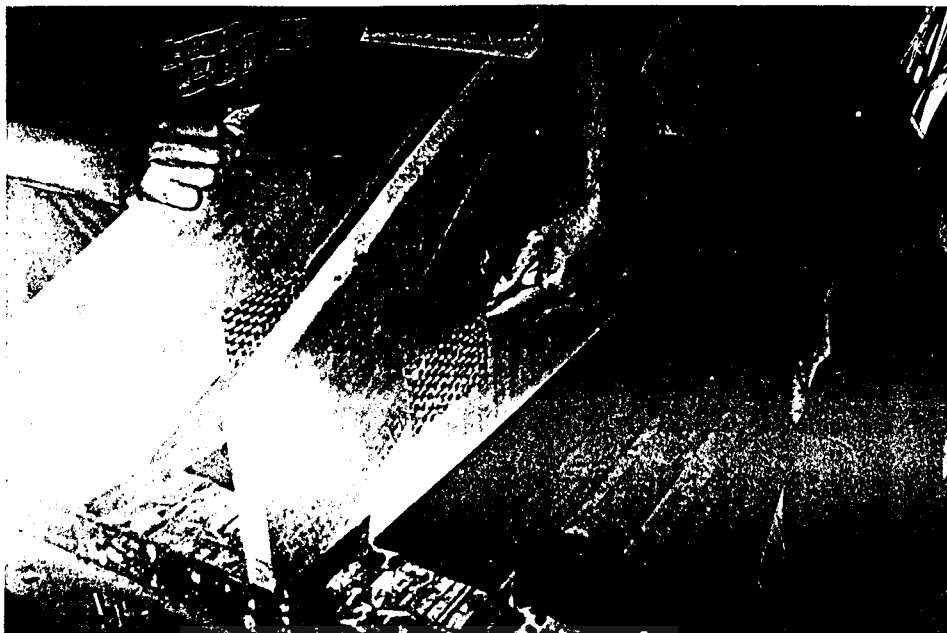
$$P_{cr} = \frac{\pi^2 EI}{L^2} = \frac{\pi^2 (80000)(20,25)}{112,8^2} = 1256.598 \text{ kg}$$



Gambar bentuk kuda –kuda dengan alat sambung claw nailplate



Gambar pengujian pembebanan kuda –kuda dengan alat sambung claw nailplate



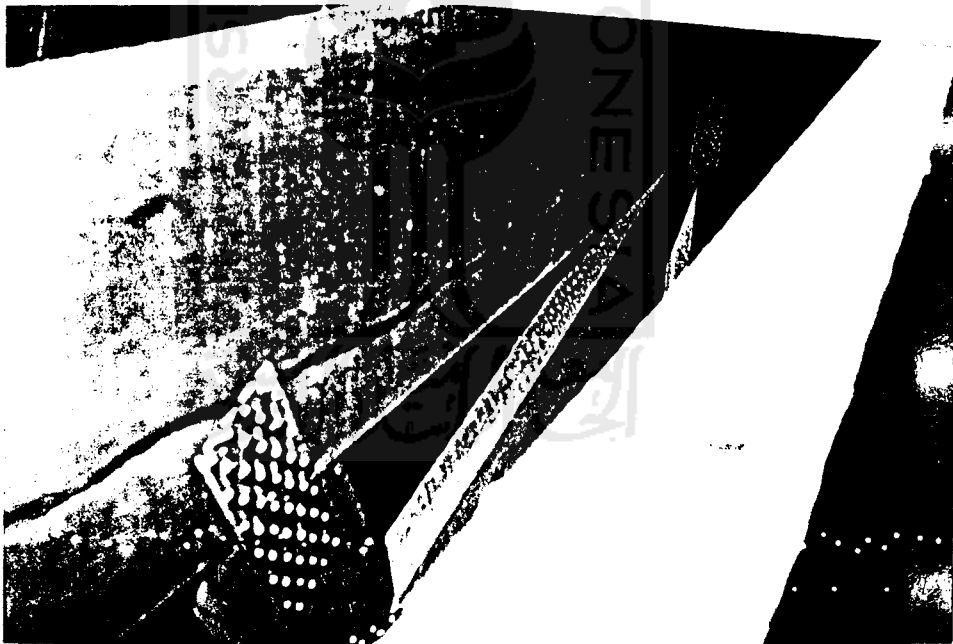
Gambar bentuk alat sambung claw nailplate



Gambar pemasangan dial gauge



Gambar lendutan yang terjadi pada saat pengujian



Gambar kerusakan yang terjadi pada batang saat pengujian