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LAMPIRAN

Lampiran 1. Proses Pembuatan Spesimen


KW0600378
15.02 g
COUNT
CAL
TARE
MODE


35.08 g


15.02


35.08 g

Lampiran 2. Pengujian Tarik

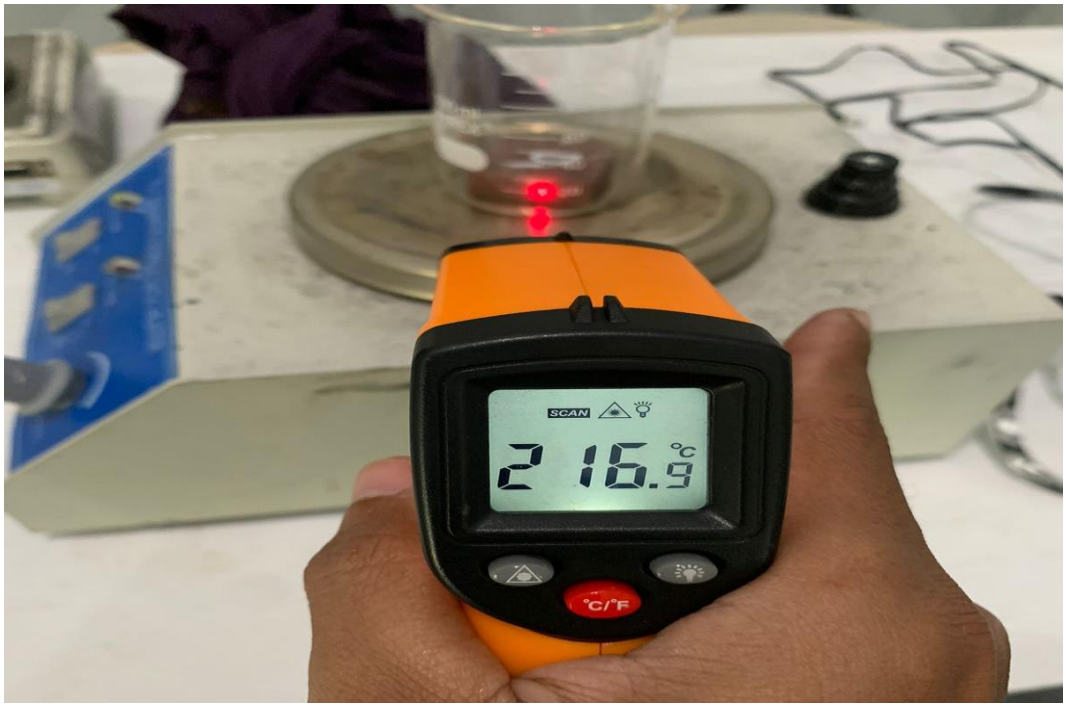
Lampiran 3. Pengujian Keausan

Lampiran 4. Pengujian Kekerasan

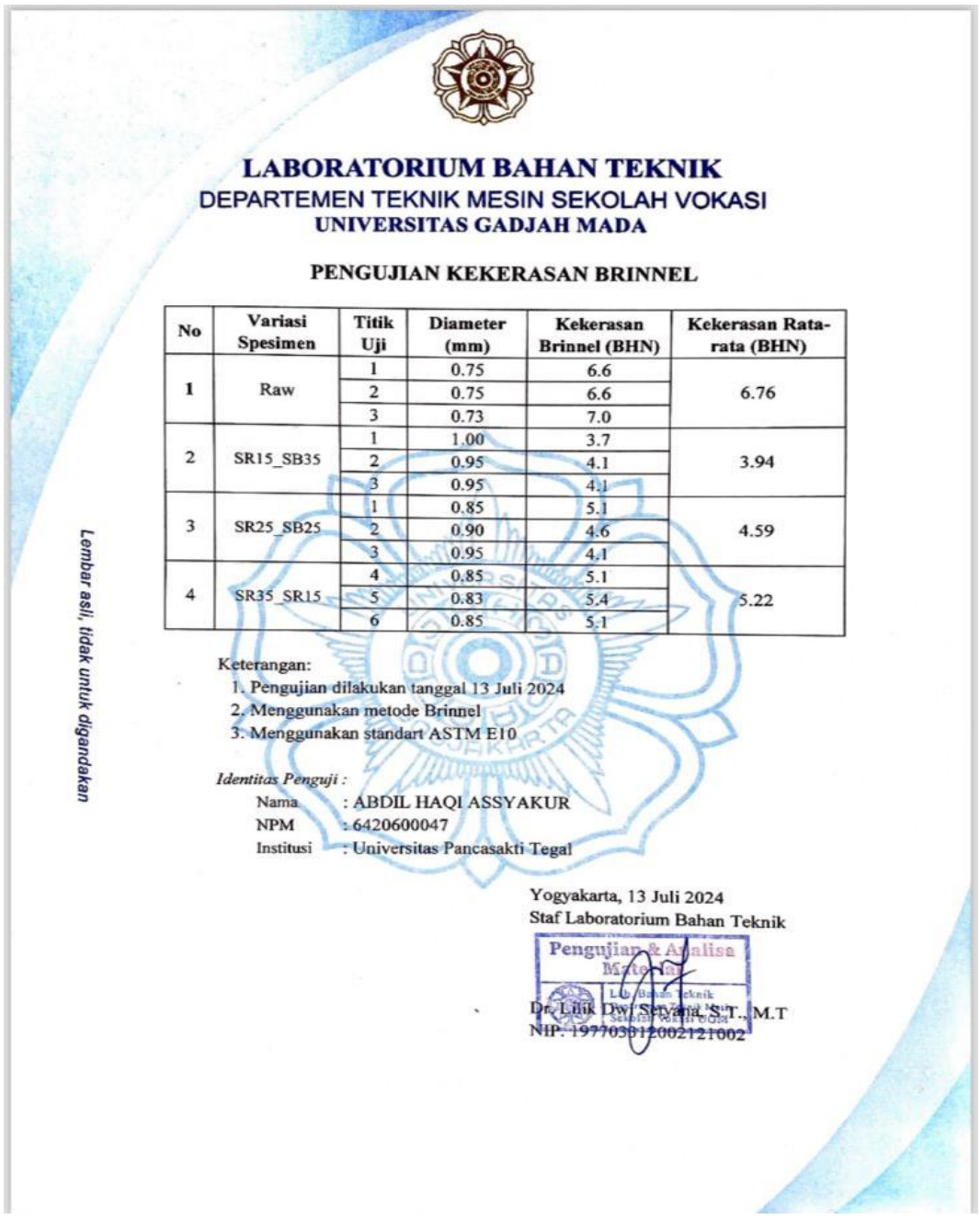
Lampiran 5. Kampas Rem Komposit

Lampiran 6. Alat uji koefisien gesek (bidang miring)

Lampiran 7. Pengujian ketahanan thermal



Lampiran 8. Serifikat Hasil Uji kekerasan



LABORATORIUM BAHAN TEKNIK
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PENGUJIAN KEKERASAN BRINNEL

No	Variasi Spesimen	Titik Uji	Diameter (mm)	Kekerasan Brinnel (BHN)	Kekerasan Rata-rata (BHN)
1	Raw	1	0.75	6.6	6.76
		2	0.75	6.6	
		3	0.73	7.0	
2	SR15_SB35	1	1.00	3.7	3.94
		2	0.95	4.1	
		3	0.95	4.1	
3	SR25_SB25	1	0.85	5.1	4.59
		2	0.90	4.6	
		3	0.95	4.1	
4	SR35_SR15	4	0.85	5.1	5.22
		5	0.83	5.4	
		6	0.85	5.1	

Keterangan:
1. Pengujian dilakukan tanggal 13 Juli 2024
2. Menggunakan metode Brinnel
3. Menggunakan standart ASTM E10

Identitas Penguji :
Nama : ABDIL HAQI ASSYAKUR
NPM : 6420600047
Institusi : Universitas Pancasakti Tegal

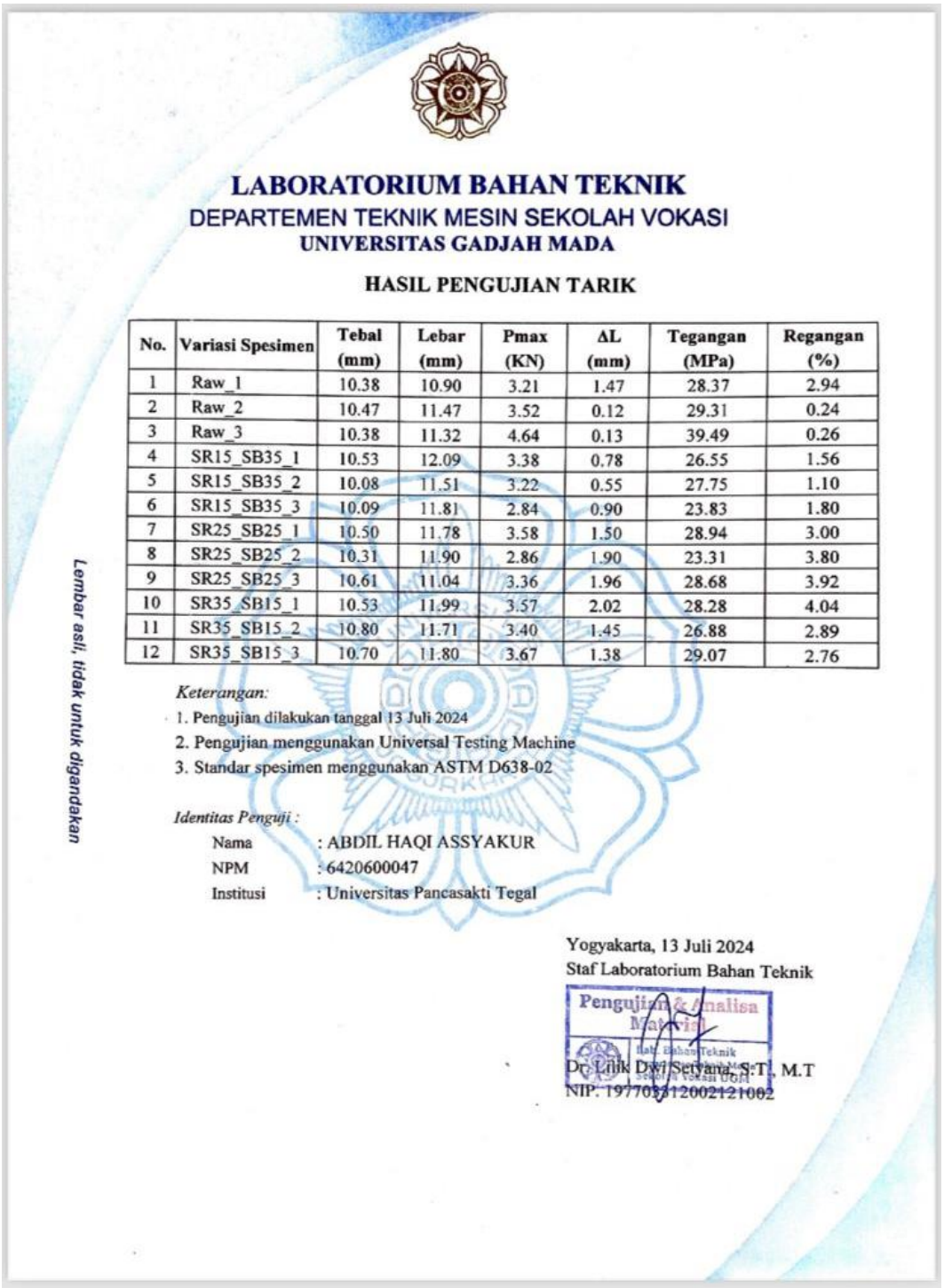
Yogyakarta, 13 Juli 2024
Staf Laboratorium Bahan Teknik

Pengujian & Analisa Material
Lab. Bahan Teknik

Dr. Lilik Dwi Setyana, S.T., M.T
NIP. 197703012002121002

Lembar asli, tidak untuk digandakan

Lampiran 8. Sertifikat Hasil Uji Tarik



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HASIL PENGUJIAN TARIK

No.	Variasi Spesimen	Tebal (mm)	Lebar (mm)	Pmax (KN)	ΔL (mm)	Tegangan (MPa)	Regangan (%)
1	Raw_1	10.38	10.90	3.21	1.47	28.37	2.94
2	Raw_2	10.47	11.47	3.52	0.12	29.31	0.24
3	Raw_3	10.38	11.32	4.64	0.13	39.49	0.26
4	SR15_SB35_1	10.53	12.09	3.38	0.78	26.55	1.56
5	SR15_SB35_2	10.08	11.51	3.22	0.55	27.75	1.10
6	SR15_SB35_3	10.09	11.81	2.84	0.90	23.83	1.80
7	SR25_SB25_1	10.50	11.78	3.58	1.50	28.94	3.00
8	SR25_SB25_2	10.31	11.90	2.86	1.90	23.31	3.80
9	SR25_SB25_3	10.61	11.04	3.36	1.96	28.68	3.92
10	SR35_SB15_1	10.53	11.99	3.57	2.02	28.28	4.04
11	SR35_SB15_2	10.80	11.71	3.40	1.45	26.88	2.89
12	SR35_SB15_3	10.70	11.80	3.67	1.38	29.07	2.76

Keterangan:
1. Pengujian dilakukan tanggal 13 Juli 2024
2. Pengujian menggunakan Universal Testing Machine
3. Standar spesimen menggunakan ASTM D638-02

Identitas Penguji :
Nama : ABDIL HAQI ASSYAKUR
NPM : 6420600047
Institusi : Universitas Pancasakti Tegal

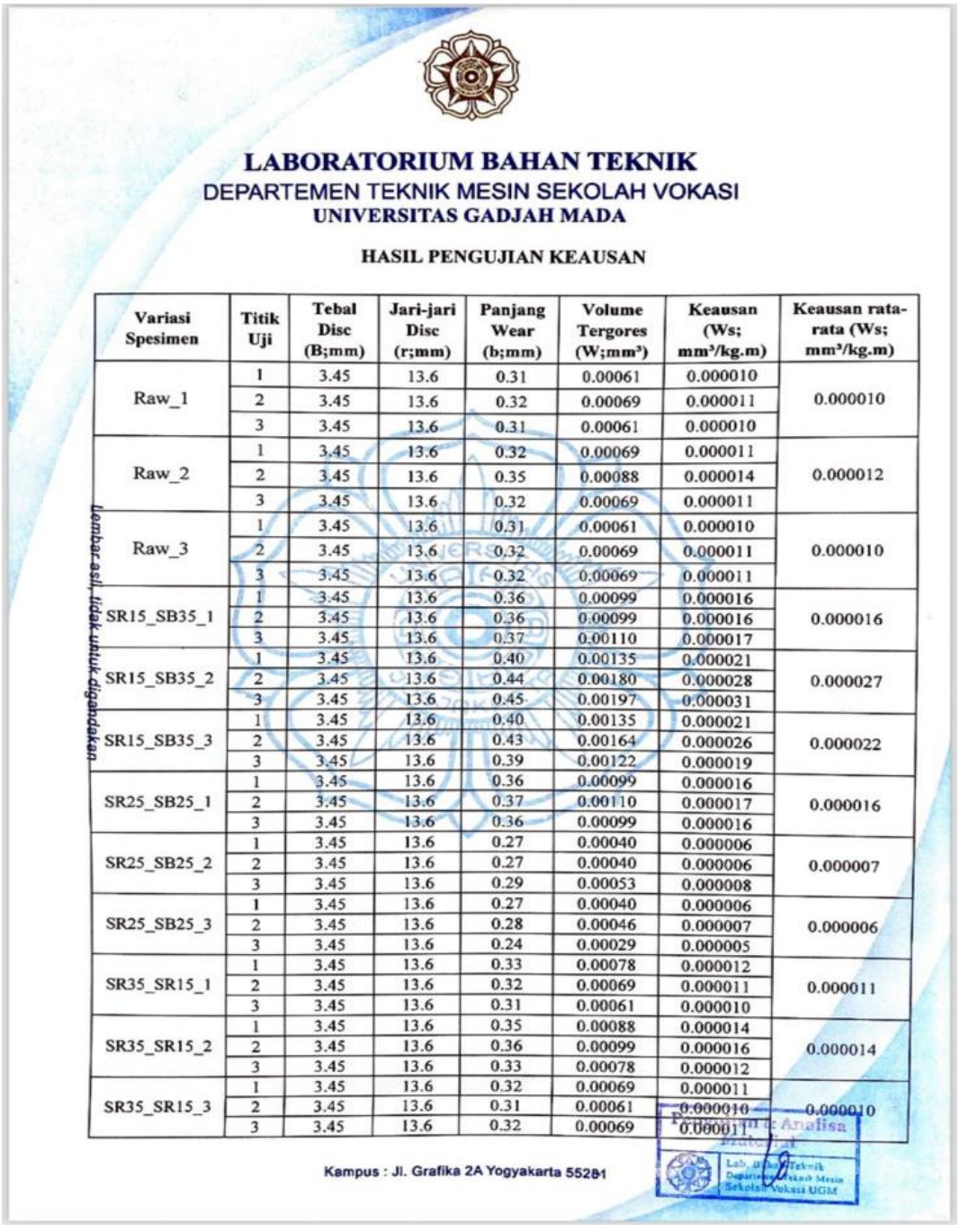
Yogyakarta, 13 Juli 2024
Staf Laboratorium Bahan Teknik

Pengujian & Analisa Material
Lab. Bahan Teknik
Sekolah Vokasi UGM

Dr. Lilik Dwi Setyana, S.T., M.T
NIP. 197705312002121002

Lembar asli, tidak untuk digandakan

Lampiran 9. Sertifikat Hasil Uji Keausan



LABORATORIUM BAHAN TEKNIK
DEPARTEMEN TEKNIK MESIN SEKOLAH VOKASI
UNIVERSITAS GADJAH MADA

HASIL PENGUJIAN KEAUSAN

Variasi Spesimen	Titik Uji	Tebal Disc (B;mm)	Jari-jari Disc (r;mm)	Panjang Wear (b;mm)	Volume Tergores (W;mm³)	Keausan (Ws; mm³/kg.m)	Keausan rata-rata (Ws; mm³/kg.m)
Raw_1	1	3.45	13.6	0.31	0.00061	0.000010	0.000010
	2	3.45	13.6	0.32	0.00069	0.000011	
	3	3.45	13.6	0.31	0.00061	0.000010	
Raw_2	1	3.45	13.6	0.32	0.00069	0.000011	0.000012
	2	3.45	13.6	0.35	0.00088	0.000014	
	3	3.45	13.6	0.32	0.00069	0.000011	
Raw_3	1	3.45	13.6	0.31	0.00061	0.000010	0.000010
	2	3.45	13.6	0.32	0.00069	0.000011	
	3	3.45	13.6	0.32	0.00069	0.000011	
SR15_SB35_1	1	3.45	13.6	0.36	0.00099	0.000016	0.000016
	2	3.45	13.6	0.36	0.00099	0.000016	
	3	3.45	13.6	0.37	0.00110	0.000017	
SR15_SB35_2	1	3.45	13.6	0.40	0.00135	0.000021	0.000027
	2	3.45	13.6	0.44	0.00180	0.000028	
	3	3.45	13.6	0.45	0.00197	0.000031	
SR15_SB35_3	1	3.45	13.6	0.40	0.00135	0.000021	0.000022
	2	3.45	13.6	0.43	0.00164	0.000026	
	3	3.45	13.6	0.39	0.00122	0.000019	
SR25_SB25_1	1	3.45	13.6	0.36	0.00099	0.000016	0.000016
	2	3.45	13.6	0.37	0.00110	0.000017	
	3	3.45	13.6	0.36	0.00099	0.000016	
SR25_SB25_2	1	3.45	13.6	0.27	0.00040	0.000006	0.000007
	2	3.45	13.6	0.27	0.00040	0.000006	
	3	3.45	13.6	0.29	0.00053	0.000008	
SR25_SB25_3	1	3.45	13.6	0.27	0.00040	0.000006	0.000006
	2	3.45	13.6	0.28	0.00046	0.000007	
	3	3.45	13.6	0.24	0.00029	0.000005	
SR35_SR15_1	1	3.45	13.6	0.33	0.00078	0.000012	0.000011
	2	3.45	13.6	0.32	0.00069	0.000011	
	3	3.45	13.6	0.31	0.00061	0.000010	
SR35_SR15_2	1	3.45	13.6	0.35	0.00088	0.000014	0.000014
	2	3.45	13.6	0.36	0.00099	0.000016	
	3	3.45	13.6	0.33	0.00078	0.000012	
SR35_SR15_3	1	3.45	13.6	0.32	0.00069	0.000011	0.000010
	2	3.45	13.6	0.31	0.00061	0.000010	
	3	3.45	13.6	0.32	0.00069	0.000011	

Lembar asli, tidak untuk digandakan

Kampus : Jl. Grafika 2A Yogyakarta 55281

Lampiran 10. Perthitungan Hasil Uji

a) Perhitungan spesimen SR3% SB7% Titik 1 :

$$\text{BHN} = \frac{2 \text{ x P}}{\pi D(D - \sqrt{(D^2 - d^2)})}$$

$$\text{BHN} = \frac{2 \text{ x } 3}{3{,}14.2{,}5(2{,}5 - \sqrt{(2{,}5^2 - 1{,}00^2)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5 - \sqrt{(6{,}25 - 1)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5 - 2{,}2912)} = 3{,}7 \text{ Kg/mm}^2$$

b) Perhitungan spesimen SR3% SB7% Titik 2 :

$$\text{BHN} = \frac{2 \text{ x P}}{\pi D(D - \sqrt{(D^2 - d^2)})}$$

$$\text{BHN} = \frac{2 \text{ x } 3}{3{,}14.2{,}5(2{,}5 - \sqrt{(2{,}5^2 - 0{,}95^2)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5 - \sqrt{(6{,}25 - 0{,}9025)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5 - 2{,}3124)} = 4{,}1 \text{ Kg/mm}^2$$

c) Perhitungan spesimen SR3% SB7% Titik 3 :

$$\text{BHN} = \frac{2 \text{ x P}}{\pi D(D - \sqrt{(D^2 - d^2)})}$$

$$\text{BHN} = \frac{2 \text{ x } 3}{3{,}14.2{,}5(2{,}5 - \sqrt{(2{,}5^2 - 0{,}95^2)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-\sqrt{(6{,}25}-0{,}9025\ )}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-2{,}3124)} = 4{,}1\ \text{Kg/mm}^2$$

Nilai rata – rata perhitungan spesimen SR3% SB7% dari titik 1-3 :

$$\text{Rata – rata} = \frac{\text{jumlah nilai}}{\text{banyaknya data}}$$

$$= \frac{3{,}7+4{,}1+4{,}1}{3}$$

$$= 3{,}94\ \text{Kg/mm}^2$$

d) Perhitungan spesimen SR5% SB5% Titik 1 :

$$\text{BHN} = \frac{2\ \text{x}\ \text{P}}{\pi\text{D}(\text{D}-\sqrt{(\text{D}^2}-\text{d}^2)\ )}$$

$$\text{BHN} = \frac{2\ \text{x}\ 3}{3{,}14.2{,}5(2{,}5-\sqrt{(2{,}5^2}-0{,}85^2\ )}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-\sqrt{(6{,}25}-0{,}7225\ )}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-2{,}3510)} = 5{,}1\ \text{Kg/mm}^2$$

e) Perhitungan spesimen SR5% SB5% Titik 2 :

$$\text{BHN} = \frac{2\ \text{x}\ \text{P}}{\pi\text{D}(\text{D}-\sqrt{(\text{D}^2}-\text{d}^2)\ )}$$

$$\text{BHN} = \frac{2\ \text{x}\ 3}{3{,}14.2{,}5(2{,}5-\sqrt{(2{,}5^2}-0{,}90^2\ )}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-\sqrt{(6{,}25}-0{,}81\ )}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-2{,}3323)} = 4{,}6 \text{ Kg/mm}^2$$

f) Perhitungan spesimen SR5% SB5% Titik 3 :

$$\text{BHN} = \frac{2 \text{ x P}}{\pi D(D-\sqrt{(D^2-d^2)})}$$

$$\text{BHN} = \frac{2 \text{ x } 3}{3{,}14.2{,}5(2{,}5-\sqrt{(2{,}5^2-0{,}95^2)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-\sqrt{(6{,}25-0{,}9025)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-2{,}3124)} = 4{,}1 \text{ Kg/mm}^2$$

Nilai rata – rata perhitungan spesimen SR5% SB5% dari titik 1-3 :

$$\text{Rata – rata} = \frac{\text{jumlah nilai}}{\text{banyaknya data}}$$

$$= \frac{5{,}1+4{,}6+4{,}1}{3}$$

$$= 4{,}59 \text{ Kg/mm}^2$$

g) Perhitungan spesimen SR7% SB3% Titik 1 :

$$\text{BHN} = \frac{2 \text{ x P}}{\pi D(D-\sqrt{(D^2-d^2)})}$$

$$\text{BHN} = \frac{2 \text{ x } 3}{3{,}14.2{,}5(2{,}5-\sqrt{(2{,}5^2-0{,}85^2)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-\sqrt{(6{,}25-0{,}7225)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-2{,}3510)} = 5{,}1 \text{ Kg/mm}^2$$

h) Perhitungan spesimen SR7% SB3% Titik 2 :

$$\text{BHN} = \frac{2 \text{ x P}}{\pi D(D-\sqrt{(D^2-d^2)})}$$

$$\text{BHN} = \frac{2 \text{ x } 3}{3{,}14.2{,}5(2{,}5-\sqrt{(2{,}5^2-0{,}83^2)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-\sqrt{(6{,}25-0{,}6889)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-2{,}3581)} = 5{,}4 \text{ Kg/mm}^2$$

i) Perhitungan spesimen SR7% SB3% Titik 3 :

$$\text{BHN} = \frac{2 \text{ x P}}{\pi D(D-\sqrt{(D^2-d^2)})}$$

$$\text{BHN} = \frac{2 \text{ x } 3}{3{,}14.2{,}5(2{,}5-\sqrt{(2{,}5^2-0{,}85^2)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-\sqrt{(6{,}25-0{,}7225)})}$$

$$\text{BHN} = \frac{6}{7{,}85(2{,}5-2{,}3510)} = 5{,}1 \text{ Kg/mm}^2$$

Nilai rata – rata perhitungan spesimen SR7% SB3% dari titik 1-3 :

$$\text{Rata – rata} = \frac{\text{jumlah nilai}}{\text{banyaknya data}}$$

$$= \frac{5{,}1+5{,}4+5{,}1}{3}$$

$$= 5{,}22 \text{ Kg/mm}^2$$

Perhitungan uji tarik

a) Rata – rata tegangan tarik SR7% SB3% ke 1

Pmax = 3,57 KN

L = 11,99 mm

T = 10,53 mm

A_o = (Tebal x Lebar)

= 10,53 x 11,99

= 126,2547 mm^2

$\sigma = \frac{\text{Pmax}}{A_o}$

$= \frac{3{,}57\ KN\ x\ 1000}{126{,}2547\ mm^2}$

= 28,28 MPa

b) Rata – rata tegangan tarik SR7% SB3% ke 2

Pmax = 3,40 KN

L = 11,71 mm

T = 10,80 mm

A_o = (Tebal x Lebar)

= 10,80 x 11,71

= 126,468 mm^2

$\sigma = \frac{\text{Pmax}}{A_o}$

$= \frac{3{,}40\ KN\ x\ 1000}{126{,}468\ mm^2}$

= 26,88 MPa

c) Rata – rata tegangan tarik SR7% SB3% ke 3

Pmax = 3,67 KN

L = 11,80 mm

T = 10,70 mm

A_o = (Tebal x Lebar)

= 10,70 x 11,80

= 126,26 mm^2

$\sigma = \frac{\text{Pmax}}{A_o}$

$= \frac{3{,}67KN\ x\ 1000}{126{,}26mm^2}$

= 29,07 MPa

Nilai tegangan rata – rata tarik variasi SR7% SB3% dari sampel 1-3

Rata – rata $= \frac{\text{jumlah nilai}}{\text{banyaknya data}}$

$= \frac{28{,}28+26{,}88+29{,}07}{3}$

= 28,1 MPa

d) Rata – rata tegangan tarik SR3% SB7% ke 1

Pmax = 3,38 KN

L = 12,09 mm

T = 10,53 mm

A_o = (Tebal x Lebar)

= 10,53 x 12,09

= 127,3077 mm^2

$\sigma = \frac{Pmax}{A_o}$

$= \frac{3{,}38KN\ x\ 1000}{127{,}3077\ mm^2}$

= 26,55 MPa

e) Rata – rata tegangan tarik SR3% SB7% ke 2

Pmax = 3,22 KN

L = 11,51 mm

T = 10,08 mm

A_o = (Tebal x Lebar)

= 10,08 x 11,51

= 116.0208 mm^2

$\sigma = \frac{Pmax}{A_o}$

$= \frac{3{,}22\ KN\ x\ 1000}{116{,}0208\ mm^2}$

= 27,75 Mpa

f) Rata – rata tegangan tarik SR3% SB7% ke 3

Pmax = 2,84 KN

L = 11,81 mm

T = 10,09 mm

A_o = (Tebal x Lebar)

= 10,09 x 11,81

= 119,1629 mm^2

$\sigma = \frac{Pmax}{A_o}$

$= \frac{2{,}84KN\ x\ 1000}{119{,}1629\ mm^2}$

= 23,83 Mpa

Nilai tegangan rata – rata variasi SR3% SB7% dari sampel 1 - 3

Rata – rata $= \frac{\text{jumlah nilai}}{\text{banyaknya data}}$

$= \frac{26{,}55+27{,}75+23{,}83}{3}$

= 26,0 MPa

g) Rata – rata tegangan tarik SR5% SB5% ke 1

Pmax = 3,58 KN

L = 11,78 mm

T = 10,50 mm

A_o = (Tebal x Lebar)

= 10,50 x 11,78

= 123,69 mm^2

σ $= \frac{\text{Pmax}}{A_o}$

$= \frac{3{,}58KN\ x\ 1000}{123{,}69\ mm^2}$

= 28,94 MPa

h) Rata – rata tegangan tarik SR5% SB5% ke 2

Pmax = 2,86 KN

L = 11,90 mm

T = 10,31

A_o = (Tebal x Lebar)

= 10,31 x 11,90

= 122,689 mm^2

σ $= \frac{\text{Pmax}}{A_o}$

$= \frac{2{,}86\ KN\ x\ 1000}{122{,}689\ mm^2}$

= 23,31 MPa

i) Rata – rata tegangan tarik SR5% SB5% ke 3

Pmax = 3,36 KN

L = 11,04

T = 10,61

A_o = (Tebal x Lebar)

= 10,61 x 11,04

= 117,1344 mm^2

$\sigma = \frac{Pmax}{A_o}$

$= \frac{3{,}36\ KN\ x\ 1000}{117{,}1344\ mm^2}$

= 28,68 MPa

Nilai tegangan rata – rata variasi SR3% SB7% dari sampel 1 - 3

Rata – rata $= \frac{\text{jumlah nilai}}{\text{banyaknya data}}$

$= \frac{28{,}94+23{,}31+28{,}68}{3}$

= 27,0 MPa

Perhitungan Hasil Uji Keausan

a) Perhitungan Raw 2 Titik 1

$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}32^3}{12\ .\ 13{,}6} = 0{,}00069 mm^3$

$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00069}{12\ .\ 13{,}6} = 0{,}000011 mm^3$

Perhitungan Raw 2 Titik 2

$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}35^3}{12\ .\ 13{,}6} = 0{,}00088 mm^3$

$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00088}{12\ .\ 13{,}6} = 0{,}000014 mm^3$

Perhitungan Raw 2 Titik 3

$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}32^3}{12\ .\ 13{,}6} = 0{,}00069 mm^3$

$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00069}{12\ .\ 13{,}6} = 0{,}000011 mm^3$

Rata-rata nilai pengujian keausan Raw 2 Titik 1-3

Rata – rata = $\frac{\text{jumlah nilai}}{\text{banyaknya data}} = \frac{0{,}000011+0{,}000014+0{,}000011}{3} = 0{,}000012\text{mm}^3$

b) Perthitungan Raw 3 Titik 1

W = $\frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}31^3}{12\ .\ 13{,}6} = 0{,}00061\text{mm}^3$

Ws = $\frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00061}{12\ .\ 13{,}6} = 0{,}000010\text{mm}^3$

Perhitungan Raw 3 Titik 2

W = $\frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}32^3}{12\ .\ 13{,}6} = 0{,}00069\text{mm}^3$

Ws = $\frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00069}{12\ .\ 13{,}6} = 0{,}000011\text{mm}^3$

Perhitungan Raw 3 Titik 3

W = $\frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}32^3}{12\ .\ 13{,}6} = 0{,}00069\text{mm}^3$

Ws = $\frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00069}{12\ .\ 13{,}6} = 0{,}000011\text{mm}^3$

Rata-rata nilai pengujian keausan Raw 3 Titik 1-3

Rata – rata = $\frac{\text{jumlah nilai}}{\text{banyaknya data}} = \frac{0{,}000010+0{,}000011+0{,}000011}{3} = 0{,}000010\text{mm}^3$

Rata-rata nilai pengujian keausan Raw 1 Titik 1-3

Rata – rata = $\frac{\text{jumlah nilai}}{\text{banyaknya data}} = \frac{0{,}000010+0{,}000012+0{,}000010}{3} = 0{,}000011\text{mm}^3$

c) Perhitungan SR3%SB7% 1 Titik 1

W = $\frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}36^3}{12\ .\ 13{,}6} = 0{,}00099\text{mm}^3$

Ws = $\frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00099}{12\ .\ 13{,}6} = 0{,}000016\text{mm}^3$

Perhitungan SR3%SB7% 2 Titik 2

$$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}36^3}{12\ .\ 13{,}6} = 0{,}00099\text{mm}^3$$

$$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00099}{12\ .\ 13{,}6} = 0{,}000016\text{mm}^3$$

Perhitungan SR3%SB7% 1 Titik 3

$$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}37^3}{12\ .\ 13{,}6} = 0{,}00110\text{mm}^3$$

$$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00110}{12\ .\ 13{,}6} = 0{,}000017\text{mm}^3$$

Rata-rata nilai pengujian keausan SR3%SB7% 1 Titik 1-3

$$\text{Rata – rata} = \frac{\text{jumlah nilai}}{\text{banyaknya data}} = \frac{0{,}000010+0{,}000011+0{,}000011}{3} = 0{,}000010\text{mm}^3$$

Rata-rata nilai pengujian keausan SR3%SB7% Variasi 1-3

$$\text{Rata – rata} = \frac{\text{jumlah nilai}}{\text{banyaknya data}} = \frac{0{,}000016+0{,}000027+0{,}000022}{3} = 0{,}000022\text{mm}^3$$

d) Perhitungan SR5%SB5% 1 Titik 1

$$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}36^3}{12\ .\ 13{,}6} = 0{,}00099\text{mm}^3$$

$$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00099}{12\ .\ 13{,}6} = 0{,}000016\text{mm}^3$$

Perhitungan SR5%SB5% 1 Titik 2

$$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}3^3}{12\ .\ 13{,}6} = 0{,}00110\text{mm}^3$$

$$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00110}{12\ .\ 13{,}6} = 0{,}000017\text{mm}^3$$

Perhitungan SR5%SB5% 1 Titik 3

$$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}36^3}{12\ .\ 13{,}6} = 0{,}00099\text{mm}^3$$

$$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00099}{12\ .\ 13{,}6} = 0{,}000016 mm^3$$

Rata-rata nilai pengujian keausan SR5%SB5% 1 Titik 1-3

$$\text{Rata – rata} = \frac{\text{jumlah nilai}}{\text{banyaknya data}} = \frac{0{,}000016+0{,}000017+0{,}000016}{3} = 0{,}000016 mm^3$$

Rata-rata nilai pengujian keausan SR5%SB5% Variasi 1-3

$$\text{Rata – rata} = \frac{\text{jumlah nilai}}{\text{banyaknya data}} = \frac{0{,}000016+0{,}000007+0{,}000006}{3} = 0{,}000010 mm^3$$

e) Perhitungan SR7%SB3% 1 Titik 1

$$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}33^3}{12\ .\ 13{,}6} = 0{,}00078 mm^3$$

$$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00078}{12\ .\ 13{,}6} = 0{,}000012 mm^3$$

Perhitungan SR7%SB3% 1 Titik 2

$$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}32^3}{12\ .\ 13{,}6} = 0{,}00069 mm^3$$

$$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00069}{12\ .\ 13{,}6} = 0{,}000011 mm^3$$

Perhitungan SR7%SB3% 1 Titik 3

$$W = \frac{B\ .\ b^3}{12\ .\ r} = \frac{3{,}45\ .\ 0{,}31^3}{12\ .\ 13{,}6} = 0{,}00061 mm^3$$

$$Ws = \frac{1{,}5\ .\ W}{P\ .\ Lo} = \frac{1{,}5\ .\ 0{,}00061}{12\ .\ 13{,}6} = 0{,}000010 mm^3$$

Rata-rata nilai pengujian keausan SR7%SB3% 1 Titik 1-3

$$\text{Rata – rata} = \frac{\text{jumlah nilai}}{\text{banyaknya data}} = \frac{0{,}000012+0{,}000011+0{,}000010}{3} = 0{,}000011 mm^3$$

Rata-rata nilai pengujian keausan SR7%SB3% Variasi 1-3

$$\text{Rata – rata} = \frac{\text{jumlah nilai}}{\text{banyaknya data}} = \frac{0{,}000011+0{,}000014+0{,}000010}{3} = 0{,}000012 mm^3$$