

LAMPIRAN

| | | |
|-------------|--|-----|
| Lampiran 1 | Hasil pemeriksaan gradasi butiran agregat halus | 93 |
| Lampiran 2 | Hasil pemeriksaan kadar air agregat halus | 95 |
| Lampiran 3 | Hasil Pemeriksaan berat jenis dan penyerapan air agregat halus | 96 |
| Lampiran 4 | Hasil Pemeriksaan berat satuan agregat halus..... | 98 |
| Lampiran 5 | Hasil Pemeriksaan kadar lumpur agregat halus..... | 100 |
| Lampiran 6 | Hasil Pemeriksaan berat jenis dan penyerapan air agregat kasar | 101 |
| Lampiran 7 | Hasil Pemeriksaan kadar lumpur agregat kasar..... | 103 |
| Lampiran 8 | Hasil Pemeriksaan kadar air agregat kasar | 104 |
| Lampiran 9 | Hasil Pemeriksaan keausan agregat kasar | 105 |
| Lampiran 10 | Hasil Pemeriksaan berat satuan agregat kasar | 106 |
| Lampiran 11 | Alat-alat pembuat beton..... | 107 |
| Lampiran 12 | Bahan penyusun beton..... | 111 |
| Lampiran 13 | Hasil pengujian kuat lentur balok..... | 113 |
| Lampiran 14 | Hasul uji tarik baja..... | 118 |



HASIL PEMERIKSAAN GRADASI BUTIRAN AGREGAT HALUS

Jenis Pengujian : Pemeriksaan Gradasi Besar Butiran Agregat Halus

Bahan : Pasir

Asal : Sungai Progo

Diperiksa : 15 Maret 2018

| Ukuran | Lubang Ayakan (mm) | Berat Tertahan (gram) | Persen Berat Tertahan (%) | Persen berat Tertahan Komulatif (%) | Persen Berat Lolos Komulatif (%) |
|--------|--------------------|-----------------------|---------------------------|-------------------------------------|----------------------------------|
| No.4 | 4,8 | 0 | 0,000 | 0,000 | 100,000 |
| No.8 | 2,4 | 10,51 | 1,051 | 1,051 | 98,949 |
| No.16 | 1,2 | 33 | 3,3 | 4,351 | 95,649 |
| No.30 | 0,6 | 78,11 | 7,811 | 12,162 | 87,838 |
| No.50 | 0,3 | 545,2 | 54,52 | 66,682 | 33,318 |
| No.100 | 0,15 | 260,48 | 26,048 | 92,73 | 7,27 |
| Pan | | 72,7 | 7,72 | | |
| Total | | 1000 | 100,000 | 176,976 | |

Analisis hitungan:

- Contoh saringan no.16

Persen berat teratahan:

$$\begin{aligned} &= \frac{\text{Berat Tertahan}}{\text{Total}} \times 100\% \\ &= \frac{33}{1000} \times 100\% \\ &= 3,3\% \end{aligned}$$

- Contoh saringan no.16

Persen berat tertahan komulatif:



$$= \text{Persen berat tertahan no.4} + \text{Persen berat tertahan no.8}$$

$$= 0,00 + 3,3 = 3,3\%$$

c. Komulatif contoh saringan no.16

Persen berat lolos komulatif:

$$= 100 - \text{Persen berat tertahan}$$

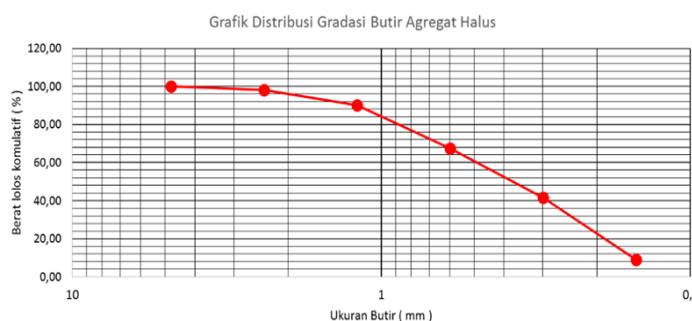
$$= 100 - 3,3 = 96,7\%$$

d. Modulus halus butir (MHB)

$$= \text{jumlah berat tertahan komulatif / 100}$$

$$= 176,976/100 = 1,769\%$$

Berdasarkan hasil dari pengujian gradasi pasir yang dilakukan di Laboratorium Teknik Sipil Universitas Muhammadiyah Yogyakarta didapatkan hasil berdasarkan tabel grafik kekasaran pasir masuk pada daerah 2 dengan nilai Modulus Halus Butir (MHB) adalah 1,769%.



Gambar ASTM hubungan nomor saringan dengan persen lolos saringan

**HASIL PEMERIKSAAN KADAR AIR AGREGAT HALUS**

Jenis Pengujian : Pemeriksaan kadar air agregat halus

Bahan : Pasir

Asal : Sungai Progo

Diperiksa : 13 Maret 2018 s/d 14 Maret 2018

| Uraian | Benda Uji | | | |
|--|-----------|-------|-------|-------|
| | Satuan | A1 | A2 | A3 |
| Berat wadah (W1) | gram | 130 | 130 | 130 |
| Berat wadah + Berat isi pasir (W2) | gram | 1000 | 1000 | 1000 |
| Berat wadah + Berat isi pasir keluar oven (W3) | gram | 984 | 990 | 987 |
| Berat air (W4) | gram | 16 | 10 | 13 |
| Kadar air | % | 1,873 | 1,162 | 1,516 |
| Rata-rata | % | 1,5 | | |

Analisis hitungan:

a. Berat air = W2-W3

Contoh benda uji 1 = 1000 – 984
= 16 gr

b. Kadar Air = $\frac{W4}{W3-W1} \times 100\%$

Contoh benda uji 1 = $\frac{16}{984-130} \times 100\%$
= 1,873%

c. Kadar air rata-rata = $\frac{KA1+KA2+KA3}{3}$
= $\frac{1,873+1,162+1,516}{3}$
= 1,5%



**HASIL PEMERIKSAAN BERAT JENIS dan PENYERAPAN AIR
AGREGAT HALUS**

Jenis Pengujian : Pemeriksaan berat jenis dan penyerapan air agregat halus

Bahan : Pasir

Asal : Sungai Progo

Diperiksa : 14 Maret 2018 s/d 17 Maret 2018

| Uraian | Benda Uji | | |
|---|-----------|------|------|
| | Satuan | B2 | C4 |
| Berat piknometer isi pasir dan air (Bt) | gram | 1085 | 1075 |
| Berat pasir setelah kering (Bk) | gram | 475 | 480 |
| Berat piknometer isi air (B) | gram | 770 | 770 |
| Berat pasir keadaan jenuh kering muka (ssd) | gram | 500 | 500 |
| Berat cawan | gram | 124 | 122 |

| Uraian | Benda Uji | | | Rata-rata |
|-----------------------------------|-----------|-------|------|-----------|
| | Satuan | B2 | C4 | |
| Berat jenis curah | gram | 2,567 | 2,46 | 2,51 |
| Berat jenis jenuh kering muka | gram | 2,702 | 2,56 | 2,631 |
| Berat jenis tampak | gram | 2,97 | 2,74 | 2,855 |
| Penyerapan air agregat halus | gram | 5,26 | 4,17 | 4,715 |
| Berat jenis kering muka rata-rata | gram | 500 | | |



Analisis hitungan:

a. Berat jenis curah $= \frac{Bk}{B+SSD-Bt}$

Contoh benda uji 1 $= \frac{475}{770+500-1085}$
 $= 2,567 \text{ gr}$

b. Berat jenis jenuh kering muka $= \frac{500}{B+SSD-Bt}$

Contoh benda uji 1 $= \frac{500}{770+500+1085}$
 $= 2,702 \text{ gr}$

c. Berat jenis tampak $= \frac{Bk}{B+Bk-Bt}$

Contoh benda uji 1 $= \frac{475}{770+475-1085}$
 $= 2,97 \text{ gr}$

d. Penyerapan air agregat halus $= \frac{SSD-Bk}{Bk} \times 100\%$

Contoh benda uji 1 $= \frac{500-475}{475} \times 100\%$
 $= 5,26 \text{ gr}$

e. Berat jenis jenuh kering muka rata-rata $= \frac{SSD_1 + SSD_2}{2}$

$$= \frac{2,702 + 2,56}{2}$$
$$= 2,631 \text{ gr}$$



HASIL PEMERIKSAAN BERAT SATUAN AGREGAT HALUS

Jenis Pengujian : Pemeriksaan berat satuan agregat halus

Bahan : Pasir

Asal : Sungai Progo

Diperiksa : 17 Maret 2018

| Uraian | Satuan | Benda Uji | |
|-------------------------------------|--------------------|-----------|-------|
| | | A | B |
| Berat bejana kosong (B1) | gr | 10250 | 10300 |
| Berat bejana kosong + Pasir (B2) | gr | 18150 | 19100 |
| Berat satuan (Bsat) | gr/cm ³ | 1.604 | 1,660 |
| Berat satuan rata-rata | gr/cm ³ | 1,632 | |

Analisis hitungan:

a. Bejan: $d = 15 \text{ cm}$

$$h = 30 \text{ cm}$$

b. Volume bejana kosong $= \frac{1}{4} \pi r^2 t$
 $= \frac{1}{4} \pi \times 15^2 \times 30$
 $= 5301 \text{ cm}^3$

c. Berat satuan (B_{sat}) $= \frac{B_2 - B_1}{\text{Volume}}$
Contoh benda uji 1 $= \frac{18100 - 10300}{5301}$
 $= 1,660 \text{ gr/m}^3$



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Lampiran 4

$$\begin{aligned} \text{d. Berat satuan rata-rata} &= \frac{B_{1\text{sat}} + B_{2\text{sat}}}{3} \\ &= \frac{1,604 + 1,660}{2} \\ &= 1,632 \text{ gr/m}^3 \end{aligned}$$



HASIL PEMERIKSAAN KADAR LUMPUR AGREGAT HALUS

Jenis Pengujian : Pemeriksaan kadar lumpur agregat halus

Bahan : Pasir

Asal : Sungai Progo

Diperiksa : 14 Maret 2018 s/d 16 Maret 2018

| Uraian | Satuan | Benda Uji | | |
|---|--------|-----------|-----|-----|
| | | D9 | D2 | D4 |
| Berat wadah + Pasir setelah di oven pertama (B1) | Gr | 500 | 500 | 500 |
| Berat wadah + Pasir setelah di oven kedua (B2) | Gr | 495 | 496 | 497 |
| Kandungan air (B3 = B1-B2) | Gr | 5 | 4 | 3 |
| Kadar lumpur | % | 1 | 0,8 | 0,6 |
| Rata-rata | % | 0,8 | | |

Analisis hitungan:

a. Kandungan air = B1 - B2

Contoh benda uji 1 = 500 - 495

= 5 gr

b. Kadar lumpur = $\frac{B1-B2}{B3} \times 100\%$

Contoh benda uji 1 = $\frac{500-495}{495} \times 100\%$

= 1,01%

c. Rata-rata kadar lumpur = $\frac{KL1+KL2+KL3}{3} \times 100\%$

= $\frac{1+0,8+0,6}{3} \times 100\%$

= 0,8%



HASIL PEMERIKSAAN BERAT JENIS dan PENYERAPAN AIR AGREGAT KASAR

Jenis Pengujian : Pemeriksaan berat jenis dan penyerapan air agregat kasar
Bahan : Kerikil
Asal : Clereng
Diperiksa : 14 Maret 2018 s/d 15 Maret 2018

| Uraian | Satuan | Benda Uji | | |
|--|--------|-----------|------|------|
| | | Bj1 | Bj2 | Bj3 |
| Berat kerikil setelah dikeringkan (Bk) | gram | 4987 | 5000 | 5000 |
| Berat kerikil dibawah air (Ba) | gram | 3099 | 3055 | 3040 |
| Berat kerikil keadaan jenuh (Bj) | gram | 5040 | 5103 | 5088 |

| Uraian | Satuan | Benda Uji | | | Rata-rata |
|-------------------------------|--------|-----------|-------|-------|-----------|
| | | Bj1 | Bj2 | Bj3 | |
| Berat jenis curah | Gram | 2,57 | 2,441 | 2,441 | 2,439 |
| Berat jenis kering muka | Gram | 2,60 | 2,492 | 2,484 | 2,491 |
| Berat jenis tampak | Gram | 2,64 | 2,571 | 2,551 | 2,571 |
| Penyerapan air agregat kasar | % | 1,06 | 2,06 | 1,76 | 1,561 |
| Berat kerikil jenuh rata-rata | | 5086 | | | |
| Penyerapan air agregat kasar | | 1,561 | | | |



Analisis hitungan:

a. Berat jenis curah $= \frac{Bk}{Bj-Ba}$

Contoh benda uji 1 $= \frac{4987}{5040-3099}$
 $= 2,57 \text{ gr}$

b. Berat jenis jenuh kering muka $= \frac{Bj}{Bj-Ba}$

Contoh benda uji 1 $= \frac{5040}{5040-3099}$
 $= 2,60 \text{ gr}$

c. Berat jenis tampak $= \frac{Bk}{Bk-Ba}$

Contoh benda uji 1 $= \frac{4987}{4987-3099}$
 $= 2,64 \text{ gr}$

d. Penyerapan air agregat kasar $= \frac{Bj-Bk}{Bk} \times 100\%$

Contoh benda uji 1 $= \frac{5040-4987}{4987} \times 100\%$
 $= 1,06 \%$

e. Berat jenis jenuh $= \frac{B\text{jenis 1}+B\text{jenis 2}+B\text{ jenis3}}{3}$

Kering muka rata-rata $= \frac{2,60+2,492+2,484}{3}$
 $= 2,491 \text{ gr}$

f. Penyerpan air rata-rata AK $= \frac{P.\text{air AK 1}+P.\text{air AK 2}+P.\text{air AK3}}{3}$

Contoh benda uji 1 $= \frac{1,06+2,06+1,76}{3}$
 $= 1,561 \%$

**HASIL PEMERIKSAAN KADAR LUMPUR AGREGAT KASAR**

Jenis Pengujian : Pemeriksaan kadar lumpur agregat kasar

Bahan : Kerikil

Asal : Clereng

Diperiksa : 14 Maret 2018 s/d 16 Maret 2018

| Uraian | Satuan | Benda Uji | | |
|---|--------|-----------|-----|-----|
| | | S1 | S2 | S3 |
| Berat wadah + Pasir setelah di oven pertama (B1) | gram | 500 | 500 | 500 |
| Berat wadah + Pasir setelah di oven kedua (B2) | gram | 485 | 481 | 486 |
| Kandungan air (B3 = B1 – B2) | gram | 15 | 19 | 14 |
| Kadar lumpur | % | 3.0 | 3.8 | 2,8 |
| Rata-rata | % | 3,2 | | |

Analisis hitungan:

a. Kandungan air = $B1 - B2$

Contoh benda uji 1 = $500 - 485$
= 3 gr

b. Kadar lumpur = $\frac{B1 - B2}{B1} \times 100\%$

Contoh benda uji 1 = $\frac{500 - 485}{500} \times 100\%$
= 3 %

c. Rata-rata kadar lumpur = $\frac{KL1 + KL2 + KL3}{3}$
= $\frac{3,0 + 3,8 + 2,8}{3}$
= 3,2%



HASIL PEMERIKSAAN KADAR AIR AGREGAT KASAR

Jenis Pengujian : Pemeriksaan kadar air agregat kasar

Bahan : Kerikil

Asal : Clereng

Diperiksa : 14 Maret 2018 s/d 16 Maret 2018

| Uraian | Satuan | Benda Uji | | |
|---|--------|-----------|--------|----------------|
| | | B1 | B2 | B3 |
| Berat wadah (W1) | gram | 121,2 | 123,7 | 121,5 |
| Berat wadah + Kerikil (W2) | gram | 1121,2 | 1123,7 | 1121,5 |
| Berat wadah + Kerikil keluar dari oven (W3) | gram | 1111,2 | 1108,7 | 10931 106,5 |
| Berat air (W4) | gram | 10 | 34,5 | 34,7 |
| Kadar air | % | 1 | 1,5 | 1,5 |
| Rata-rata | % | 1,33 | | |

Analisis hitungan:

a. Berat air = $W_2 - W_1$

Contoh benda uji 1 = $1121,2 - 1111,2$
= 10 gr

b. Kadar air = $\frac{W_4}{W_3 - W_1} \times 100\%$

Contoh benda uji 1 = $\frac{10}{1111,2 - 121,2} \times 100\%$
= 1%

c. Kadar air rata-rata = $\frac{KA_1 + KA_2 + KA_3}{3}$
= $\frac{1+1,5+1,5}{3}$
= 1,33%

**HASIL PEMERIKSAAN KEAUSAN AGREGAT KASAR**

Jenis Pengujian : Pemeriksaan keausan agregat kasar

Bahan : Kerikil

Asal : Clereng

Diperiksa : 18 Maret 2018

| Uraian | Satuan | Benda Uji | | |
|--------------------------------|--------|-----------|-------|-------|
| | | 1 | 2 | 3 |
| Berat sebelum masuk mesin (B1) | gram | 5000 | 5000 | 5000 |
| Berat setelah masuk mesin (B2) | gram | 4085 | 4079 | 4083 |
| Keausan | % | 18,3 | 18,42 | 18,34 |
| Keausan rata-rata | % | 18,35 | | |

Analisis hitungan:

$$\text{a. Keausan} = \frac{B1 - B2}{B1} \times 100\%$$

$$\text{Contoh benda uji 1} = \frac{5000 - 4085}{5000} \times 100\% \\ = 18,3\%$$

$$\text{b. Keausan rata-rata} = \frac{\text{Keausan1} + \text{Keausan2} + \text{Keausan3}}{3} \\ = \frac{18,3 + 18,42 + 18,34}{3} \\ = 18,35\%$$

**HASIL PEMERIKSAAN BERAT SATUAN AGREGAT KASAR**

Jenis Pengujian : Pemeriksaan berat satuan agregat kasar

Bahan : Kerikil

Asal : Clereng

Diperiksa : 18 Maret 2018

| Uraian | Satuan | Benda Uji | | |
|-------------------------------|--------------------|-----------|-------|-------|
| | | A | B | C |
| Berat bejana kosong (B1) | gr | 10850 | 10900 | 10800 |
| Berat bejana kosong + Kerikil | gr | 18550 | 18590 | 18350 |
| Berat satuan | gr/cm ³ | 1,452 | 1,460 | 1,424 |
| Rata-rata | gr/cm ³ | 1,445 | | |

Analisis hitungan:

a. Bejana: $d = 15 \text{ cm}$

$$h = 30 \text{ cm}$$

$$\begin{aligned} \text{b. Volume bejana kosong} &= \frac{1}{4} \pi r^2 t \\ &= \frac{1}{4} \pi \times 15^2 \times 30 \\ &= 5301 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{c. Berat satuan } (B_{sat}) &= \frac{B_2 - B_1}{\text{Volume}} \\ \text{Contoh benda uji 1} &= \frac{18550 - 10850}{5301} \\ &= 1,452 \text{ gr/m}^3 \end{aligned}$$

$$\begin{aligned} \text{d. Berat satuan rata-rata} &= \frac{B_{1sat} + B_{2sat} + B_{3sat}}{3} \\ &= \frac{1,452 + 1,460 + 1,424}{3} \\ &= 1,445 \text{ gr/m}^3 \end{aligned}$$



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Lampiran 11

ALAT-ALAT PEMBUAT BETON



Gambar 1 Oven suhu maksimal 220°C



Gambar 2 Ayakan nomor 4 (4,8mm), 8 (2,4mm), 16 (1,2mm), 30 (0,6mm), 50 (0,3mm), 100 (0,15mm) dan pan.



Gambar 3 Neraca Ohaus ketelitian 5,0 gram



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Lampiran 11



Gambar 4 Timbangan Digital dengan ketelitian 5,0 gram



Gambar 5 Mesin Los Angeles



Gambar 6 Universal Machine Test



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Lampiran 11



Gambar 7 Mixer dengan kapasitas 50 kg



Gambar 8 Deking beton (tahu beton)



Gambar 9 Bekisting Balok Beton



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Lampiran 11



Gambar 10 Universal Machine Test



Gambar 11 Tulangan rangka



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Lampiran 12

BAHAN PENYUSUN BETON



Gambar 12 Agregat Kasar / Batu Pecah



Gambar 13 Semen (PPC 1 atau Portland Pozolan tipe 1)



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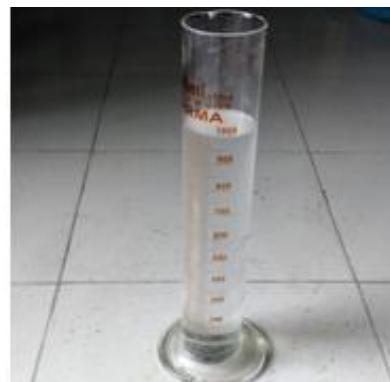
Lampiran 12



Gambar 14 Pasir Sungai Progo



Gambar 15 SikaCim Bonding Adhesive



Gambar 16 Keperluan Air

**HASIL PENGUJIAN KUAT LENTUR BALOK**

- Hasil Kuat Lentur Balok Sambungan tpa SikaCim Bonding Adhesive (BSTS) A1, A2 dan A3 yang diuji pada tanggal 8 Juni 2018.

===== UNIVERSAL TESTING DATA REPORT =====

DATE : 6 -8 -2018
MAX CAPACITY : 30000.0 KG TEMPERATURE : 29 °C
LOADING MODE : COMPRESS TEST SPEED : MM/min
LENGTH : 150.000 MM CROSS AREA : 900.000 MM²

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 3429.00 | 3.81000 | 2.80000 | 1.86667 |
| BREAK POINT | 2167.80 | 2.40867 | 2.72000 | 1.81333 |

LOT NUMBER : 1
TEST NUMBER : 0. MAX TEST GAIN: G5.

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 3429.00 | 3.81000 | 2.80000 | 1.86667 |
| BREAK POINT | 2167.80 | 2.40867 | 2.72000 | 1.81333 |

Gambar 17 Hasil uji kuat lentur beton A1

===== UNIVERSAL TESTING DATA REPORT =====

DATE : 6 -8 -2018
MAX CAPACITY : 30000.0 KG TEMPERATURE : 29 °C
LOADING MODE : COMPRESS TEST SPEED : MM/min
LENGTH : 150.000 MM CROSS AREA : 900.000 MM²

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 3295.50 | 3.66167 | 2.32000 | 1.54667 |
| BREAK POINT | 2261.10 | 2.51233 | 0.04000 | 0.02667 |

LOT NUMBER : 2
TEST NUMBER : 0. MAX TEST GAIN: G5.

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 3295.50 | 3.66167 | 2.32000 | 1.54667 |
| BREAK POINT | 2261.10 | 2.51233 | 0.04000 | 0.02667 |

Gambar 18 Hasil uji kuat lentur balok beton A2



===== UNIVERSAL TESTING DATA REPORT =====

DATE : 6 -8 -2018
MAX CAPACITY : 30000.0 KG TEMPERATURE : 29 °C
LOADING MODE : COMPRESS TEST SPEED : MM/min
LENGTH : 150.000 MM CROSS AREA : 900.000 MM²

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 3515.10 | 3.90567 | 7.44000 | 4.96000 |
| BREAK POINT | 2346.30 | 2.60700 | 4.40000 | 2.93333 |

LOT NUMBER : 3.
TEST NUMBER : 0. MAX TEST GAIN: G5.

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 3515.10 | 3.90567 | 7.44000 | 4.96000 |
| BREAK POINT | 2346.30 | 2.60700 | 4.40000 | 2.93333 |

Gambar 19 Hasil uji kuat lentur balok beton A3

- Hasil Kuat Lentur Balok Sambungan dengan SikaCim Bonding Adhesive (BSDS) A1, A2 dan A3 yang diuji pada tanggal 5 Juli 2018.

===== UNIVERSAL TESTING DATA REPORT =====

DATE : 7 -5 -2018
MAX CAPACITY : 30000.0 KG TEMPERATURE : 29 °C
LOADING MODE : COMPRESS TEST SPEED : MM/min
LENGTH : 160.000 MM CROSS AREA : 9680.00 MM²

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 4031.70 | 0.41650 | 4.12000 | 2.57500 |
| BREAK POINT | 2676.30 | 0.27648 | 1.64000 | 1.02500 |

LOT NUMBER : 1.
TEST NUMBER : 0. MAX TEST GAIN: G5.

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 4031.70 | 0.41650 | 4.12000 | 2.57500 |
| BREAK POINT | 2676.30 | 0.27648 | 1.64000 | 1.02500 |

Gambar 20 Hasil uji kuat lentur balok B1



UNIVERSITAS MUHAMMADIYAH YOGYAKARTA

Fakultas Teknik Program Studi S-1 Teknik Sipil

Laboratorium Teknologi Bahan Kontruksi

Jl. Lingkar Selatan, Tamantirto, Kasihan, Bantul, D.I. Yogyakarta 55183

Lampiran 13

===== UNIVERSAL TESTING DATA REPORT =====

DATE : 7 -5 -2018
MAX CAPACITY : 30000.0 KG TEMPERATURE : 29 °C
LOADING MODE : COMPRESS TEST SPEED : MM/min
LENGTH : 160.000 MM CROSS AREA : 9680.00 MM²

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 4108.95 | 0.42448 | 4.88000 | 3.05000 |
| BREAK POINT | 2655.75 | 0.27435 | 2.64000 | 1.65000 |

LOT NUMBER : 2
TEST NUMBER : 0. MAX TEST GAIN: G5.

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 4031.70 | 0.41650 | 4.12000 | 2.57500 |
| BREAK POINT | 2676.30 | 0.27648 | 1.64000 | 1.02500 |

Gambar 21 Hasil kuat uji lentur balok B2

===== UNIVERSAL TESTING DATA REPORT =====

DATE : 7 -5 -2018
MAX CAPACITY : 30000.0 KG TEMPERATURE : 29 °C
LOADING MODE : COMPRESS TEST SPEED : MM/min
LENGTH : 160.000 MM CROSS AREA : 9680.00 MM²

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 4245.30 | 0.43856 | 6.00000 | 3.75000 |
| BREAK POINT | 2886.60 | 0.29820 | 3.28000 | 2.05000 |

LOT NUMBER : 3
TEST NUMBER : 0. MAX TEST GAIN: G5.

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 4245.30 | 0.43856 | 6.00000 | 3.75000 |
| BREAK POINT | 2886.60 | 0.29820 | 3.28000 | 2.05000 |

Gambar 22 Hasil kuat uji lentur balok B3



UNIVERSITAS MUHAMMADIYAH YOGYAKARTA

Fakultas Teknik Program Studi S-1 Teknik Sipil

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Jl. Lingkar Selatan, Tamantirto, Kasihan, Bantul, D.I. Yogyakarta 55183

Lampiran 13

3. Hasil Kuat Lentur Balok Normal tanpa sambungan (BNTS) C1, C2 dan C3 yang diuji pada tanggal 7 Juli 2018.

===== UNIVERSAL TESTING DATA REPORT =====

DATE : 7 -7 -2018 TEMPERATURE : 28 °C
MAX CAPACITY : 30000.0 KG TEST SPEED : MM/min
LOADING MODE : COMPRESS CROSS AREA : 9346.50 MM²
LENGTH : 155.000 MM

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 4437.60 | 0.47479 | 7.76000 | 5.00645 |
| BREAK POINT | 2816.70 | 0.30136 | 5.12000 | 3.30323 |

LOT NUMBER : 1 TEST NUMBER : 0. MAX TEST GAIN: G5.

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 4437.60 | 0.47479 | 7.76000 | 5.00645 |
| BREAK POINT | 2816.70 | 0.30136 | 5.12000 | 3.30323 |

Gambar 23 Hasil kuat lentur balok C1

===== UNIVERSAL TESTING DATA REPORT =====

DATE : 7 -7 -2018 TEMPERATURE : 28 °C
MAX CAPACITY : 30000.0 KG TEST SPEED : MM/min
LOADING MODE : COMPRESS CROSS AREA : 9346.50 MM²
LENGTH : 155.000 MM

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 4183.80 | 0.44763 | 8.44000 | 5.44516 |
| BREAK POINT | 2715.90 | 0.29058 | 5.36000 | 3.45806 |

LOT NUMBER : 2 TEST NUMBER : 0. MAX TEST GAIN: G5.

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 4183.80 | 0.44763 | 8.44000 | 5.44516 |
| BREAK POINT | 2715.90 | 0.29058 | 5.36000 | 3.45806 |

Gambar 24 Hasil kuat lentur balok C2



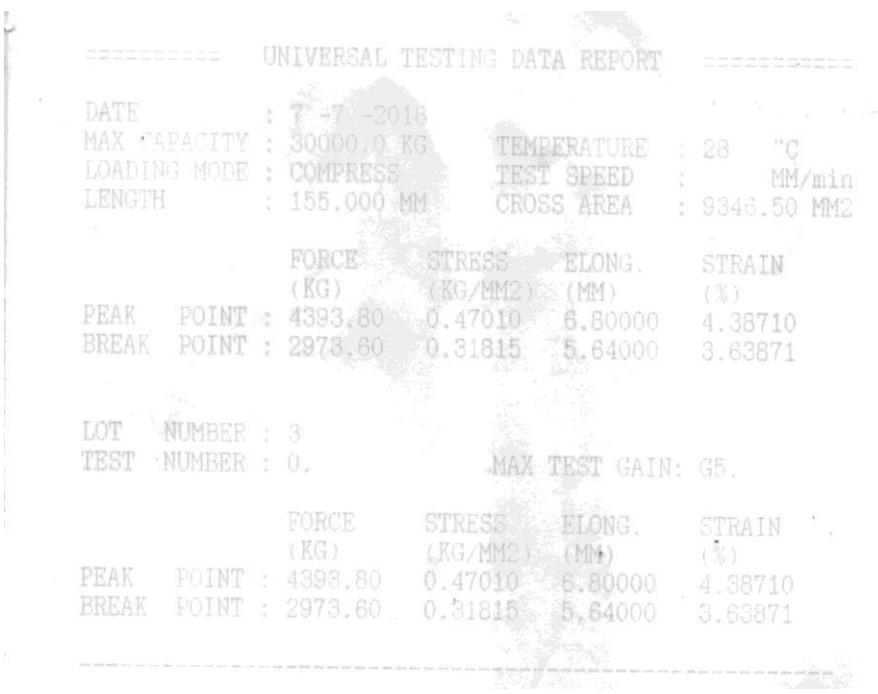
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Jl. Lingkar Selatan, Tamantirto, Kasihan, Bantul, D.I. Yogyakarta 55183

Lampiran 13



Gambar 25 Hasil kuat lentur balok C3



UNIVERSITAS MUHAMMADIYAH YOGYAKARTA

Fakultas Teknik Program Studi S-1 Teknik Sipil

Laboratorium Teknologi Bahan Kontruksi

Jl. Lingkar Selatan, Tamantirto, Kasihan, Bantul, D.I. Yogyakarta 55183

Lampiran 14

HASIL UJI TARIK BAJA

Tulangan D8 (1)

UNIVERSAL TESTING DATA REPORT

| | | | | | |
|--------------|---|------------|-----------------------|---------|-------------------------|
| DATE | : | 4 -25-2018 | TEMPERATURE | : | 30 °C |
| MAX CAPACITY | : | 30000.0 KG | TEST SPEED | : | MM/min |
| LOADING MODE | : | COMPRESS | CROSS AREA | : | 44.1000 MM ² |
| LENGTH | : | 200.000 MM | | | |
| | | FORCE | STRESS | ELONG. | STRAIN |
| | | (KG) | (KG/MM ²) | (MM) | (%) |
| PEAK POINT | : | 2763.10 | 63.1088 | 40.0400 | 20.0200 |
| BREAK POINT | : | 2703.30 | 61.2993 | 46.0400 | 23.0200 |

LOT NUMBER : 1

TEST NUMBER : 0

MAX TEST GAIN: G10

| | | | | | |
|-------------|-------|-----------------------|---------|---------|---------|
| | FORCE | STRESS | ELONG. | STRAIN | |
| | (KG) | (KG/MM ²) | (MM) | (%) | |
| PEAK POINT | : | 2763.10 | 63.1088 | 40.0400 | 20.0200 |
| BREAK POINT | : | 2703.30 | 61.2993 | 46.0400 | 23.0200 |
| MTRG NO. 0 | : | 1915.05 | 43.4251 | 4.00000 | 2.00000 |
| MTRG NO. 1 | : | 1921.05 | 43.5812 | 6.00000 | 4.00000 |
| MTRG NO. 2 | : | 2187.50 | 48.4693 | 12.0400 | 6.02000 |
| MTRG NO. 3 | : | 2371.95 | 53.7857 | 16.0400 | 8.02000 |
| MTRG NO. 4 | : | 2534.70 | 57.4762 | 20.0000 | 10.0000 |
| MTRG NO. 5 | : | 2645.70 | 59.1993 | 24.1200 | 12.0600 |
| MTRG NO. 6 | : | 2710.80 | 61.4895 | 28.0400 | 14.0200 |
| MTRG NO. 7 | : | 2751.45 | 62.3911 | 32.0800 | 16.0400 |
| MTRG NO. 8 | : | 2773.80 | 62.8979 | 36.0400 | 18.0200 |
| MTRG NO. 9 | : | 2763.10 | 63.1088 | 40.0400 | 20.0200 |

Gambar 26 Hasil pengujian tarik baja



UNIVERSITAS MUHAMMADIYAH YOGYAKARTA

Fakultas Teknik Program Studi S-1 Teknik Sipil

Laboratorium Teknologi Bahan Kontruksi

Jl. Lingkar Selatan, Tamantirto, Kasihan, Bantul, D.I. Yogyakarta 55183

Lampiran 14

Tulangan D8(2)

UNIVERSAL TESTING DATA REPORT

| | | | | |
|--------------|---|------------|---------------|-------------------------|
| DATE | : | 5 -2 -2018 | | |
| MAX CAPACITY | : | 30000.0 KG | TEMPERATURE : | 30 °C |
| LOADING MODE | : | TENSION | TEST SPEED : | MM/min |
| LENGTH | : | 200.000 MM | CROSS AREA : | 50.2400 MM ² |

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | : 2743.80 | 54.6138 | 36.3600 | 18.1800 |
| BREAK POINT | : 2656.65 | 52.8791 | 40.4000 | 20.2000 |

LOT NUMBER : 1

TEST NUMBER : 0.

MAX TEST GAIN: G10

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | : 2743.80 | 54.6138 | 36.3600 | 18.1800 |
| BREAK POINT | : 2656.65 | 52.8791 | 40.4000 | 20.2000 |

| | | | | | |
|------------|---|---------|---------|---------|---------|
| MTRG NO. 0 | : | 1885.80 | 37.5358 | 4.00000 | 2.00000 |
| MTRG NO. 1 | : | 1944.75 | 38.7092 | 8.04000 | 4.02000 |
| MTRG NO. 2 | : | 2220.90 | 44.2058 | 12.0000 | 6.00000 |
| MTRG NO. 3 | : | 2433.44 | 48.4565 | 16.0600 | 8.04000 |
| MTRG NO. 4 | : | 2575.95 | 51.2728 | 20.0400 | 10.0200 |
| MTRG NO. 5 | : | 2683.40 | 53.0135 | 24.1200 | 12.0600 |
| MTRG NO. 6 | : | 2710.94 | 53.9599 | 28.0400 | 14.0200 |
| MTRG NO. 7 | : | 2736.00 | 54.4586 | 32.0800 | 16.0400 |
| MTRG NO. 8 | : | 2743.85 | 54.6106 | 36.0000 | 18.0000 |
| MTRG NO. 9 | : | 2656.65 | 52.8791 | 40.0000 | 20.0000 |

Gambar 27 Hasil pengujian tarik baja



UNIVERSITAS MUHAMMADIYAH YOGYAKARTA

Fakultas Teknik Program Studi S-1 Teknik Sipil

Laboratorium Teknologi Bahan Kontruksi

Jl. Lingkar Selatan, Tamantirto, Kasihan, Bantul, D.I. Yogyakarta 55183

Lampiran 14

Tulangan D6 (1)

----- UNIVERSAL TESTING DATA REPORT -----

| | | | | | |
|--------------|---|-------------|-------------|---|-------------------------|
| DATE | : | 4 -28 -2018 | TEMPERATURE | : | 30 °C |
| MAX CAPACITY | : | 30000,0 KG | TEST SPEED | : | MM/min |
| LOADING MODE | : | TENSION | CROSS AREA | : | 26.2600 MM ² |
| LENGTH | : | 200.000 MM | | | |

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | : 1102.20 | 39.0021 | 47.6800 | 23.8400 |
| BREAK POINT | : 1069.65 | 37.8503 | 58.4800 | 29.2400 |

LOT NUMBER : 2.
TEST NUMBER : 0. MAX TEST GAIN: 910

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | : 1102.20 | 39.0021 | 47.6800 | 23.8400 |
| BREAK POINT | : 1069.65 | 37.8503 | 58.4800 | 29.2400 |

| | | | | | |
|----------|---|-----------|---------|---------|---------|
| MTRG NO. | 0 | : 769.050 | 27.2180 | 4.06000 | 2.04000 |
| MTRG NO. | 1 | : 913.500 | 32.3248 | 8.08000 | 4.04000 |
| MTRG NO. | 2 | : 922.200 | 32.6327 | 12.0400 | 6.02000 |
| MTRG NO. | 3 | : 922.200 | 32.6327 | 16.0400 | 8.02000 |
| MTRG NO. | 4 | : 933.000 | 35.1380 | 20.0600 | 10.0400 |
| MTRG NO. | 5 | : 1031.10 | 36.4862 | 24.0000 | 12.0000 |
| MTRG NO. | 6 | : 1056.75 | 37.3935 | 28.0600 | 14.0400 |
| MTRG NO. | 7 | : 1072.95 | 37.9670 | 32.1200 | 16.0600 |
| MTRG NO. | 8 | : 1086.15 | 38.4341 | 36.0600 | 18.0400 |
| MTRG NO. | 9 | : 1094.40 | 38.7261 | 39.0600 | 19.9800 |

Gambar 28 Hasil pengujian tarik baja



UNIVERSITAS MUHAMMADIYAH YOGYAKARTA

Fakultas Teknik Program Studi S-1 Teknik Sipil

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Jl. Lingkar Selatan, Tamantirto, Kasihan, Bantul, D.I. Yogyakarta 55183

Lampiran 14

Tulangan D6 (2)

UNIVERSAL TESTING DATA REPORT

DATE : 4-26-2018
MAX CAPACITY : 30000.0 KG TEMPERATURE : 30 °C
LOADING MODE : TENSION TEST SPEED : MM/min
LENGTH : 300.000 MM CROSS AREA : 28.2800 MM²

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 1354.05 | 47.9140 | 44.2400 | 22.1200 |
| BREAK POINT | 1312.80 | 46.4543 | 53.5600 | 26.7800 |

LOT NUMBER : 1
TEST NUMBER : 0. MAX TEST GAIN: G10

| | FORCE (KG) | STRESS (KG/MM ²) | ELONG. (MM) | STRAIN (%) |
|-------------|---------------|---------------------------------|----------------|---------------|
| PEAK POINT | 1354.05 | 47.9140 | 44.2400 | 22.1200 |
| BREAK POINT | 1312.80 | 46.4543 | 53.5600 | 26.7800 |

| | | | | |
|------------|-----------|---------|---------|---------|
| MTRG NO. 0 | : 963.150 | 34.0517 | 4.04000 | 2.02000 |
| MTRG NO. 1 | : 1023.15 | 38.2048 | 8.04000 | 4.02000 |
| MTRG NO. 2 | : 1066.70 | 38.5244 | 12.0800 | 6.04000 |
| MTRG NO. 3 | : 1180.50 | 41.7728 | 16.0000 | 8.00000 |
| MTRG NO. 4 | : 1243.80 | 44.0127 | 20.0800 | 10.0400 |
| MTRG NO. 5 | : 1286.55 | 45.5361 | 24.0800 | 12.0400 |
| MTRG NO. 6 | : 1315.50 | 46.5499 | 28.0500 | 14.0400 |
| MTRG NO. 7 | : 1353.95 | 47.2027 | 32.0500 | 16.0400 |
| MTRG NO. 8 | : 1345.05 | 47.5855 | 36.0400 | 18.0200 |
| MTRG NO. 9 | : 1351.05 | 47.8078 | 40.0000 | 20.0000 |

Gambar 29 Hasil pengujian tarik baja