

LAMPIRAN

لَمْبَرَان

Lampiran 1 Pemeriksaan Berat Jenis Aspal

PEMERIKSAAN BERAT JENIS ASPAL

Material : Aspal Starbit E-55
Sumber : Bintang Djaja, Cilacap
Tanggal Uji : 23 Mei 2019

HASIL PEMERIKSAAN

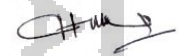
| No. | Pemeriksaan | Sampel | |
|-----|--|--------|-------|
| | | 1 | 2 |
| 1 | Berat Picnometer Kosong (gr) | 20,57 | 20,68 |
| 2 | Berat Picnometer + Aquadest (gr) | 43,53 | 43,65 |
| 3 | Berat Aquadest (gr) (2-1) | 22,96 | 22,97 |
| 4 | Berat Picnometer + Aspal (gr) | 22,81 | 22,38 |
| 5 | Berat Aspal (gr) (4-1) | 2,24 | 1,7 |
| 6 | Berat Picnometer + Aspal + Aquadest (gr) | 43,67 | 43,77 |
| 7 | Berat Aquadest (gr) (6-4) | 20,86 | 21,39 |
| 8 | Volume Aspal (gr) (3-7) | 2,1 | 1,58 |
| 9 | Berat Jenis Aspal (5/8) | 1,067 | 1,076 |
| 10 | Rata-Rata BJ Aspal | 1,071 | |

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Lampiran 2 Pemeriksaan Kelarutan Aspal Dalam CCL4/TCE

PEMERIKSAAN KELARUTAN ASPAL DALAM CCL4 / TCE

Material : Aspal Starbit E-55
Sumber : Bintang Djaja, Cilacap
Tanggal Uji : 23 Mei 2019
PERSIAPAN PEMERIKSAAN

| No. | Pemeriksaan | Keterangan | Pembacaan | |
|-----|-------------|------------|-----------|-----------|
| | | | Waktu | Suhu (°C) |
| 1 | Penimbangan | Mulai | 10.30 | 27 |
| 2 | Pelarutan | Mulai | 10.40 | 27 |
| 3 | Penyaringan | Mulai | 10.43 | 27 |
| | | Selesai | 10.55 | 27 |
| 4 | Di Oven | Mulai | 10.55 | 110 |
| 5 | Penimbangan | Selesai | 11.16 | 27 |

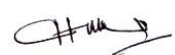
HASIL PEMERIKSAAN

| No. | Pemeriksaan | Benda Uji | |
|-----|---|-----------|--------|
| | | 1 | 2 |
| 1 | Berat Erlen Mayer Kosong (gr) | 74,11 | 71,29 |
| 2 | Berat Erlen Mayer Kosong + Aspal (gr) | 77,92 | 74,89 |
| 3 | Berat Aspal (gr) (2-1) | 3,81 | 3,6 |
| 4 | Berat Kertas Saring Bersih (gr) | 0,57 | 0,57 |
| 5 | Berat Kertas Saring Bersih + Mineral (gr) | 0,6 | 0,6 |
| 6 | Berat Mineral (gr) (5-4) | 0,03 | 0,03 |
| 7 | Persentase Mineral (6/3 X 100%) | 0,79 | 0,83 |
| 8 | Aspal Yang Larut (100%-7) | 99,21% | 99,17% |
| 9 | Rata-Rata Aspal Yang Larut (100%) | 99,19% | |

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Lampiran 3 Pemeriksaan Daktilitas

PEMERIKSAAN DAKTILITAS (*DUCTILITY*) / RESIDUE

Material : Aspal Starbit E-55
Sumber : Bintang Djaja, Cilacap
Tanggal Uji : 23 Mei 2019

PERSIAPAN PEMERIKSAAN

| No. | Pemeriksaan | Keterangan | Waktu | Temperatur |
|-----|------------------------|--|----------|--|
| 1 | Persiapan Benda Uji | Aspal Dipanaskan | 15 Menit | Suhu Pemanasan $\pm 135^{\circ}\text{C}$ |
| 2 | Mendinginkan Benda Uji | Didiamkan Pada Suhu Ruang | 60 Menit | Suhu Ruang $\pm 28^{\circ}\text{C}$ |
| 3 | Perendaman Benda Uji | Direndam Dalam Waterbath Pada Suhu 25°C | 60 Menit | Suhu Waterbath $\pm 25^{\circ}\text{C}$ |
| 4 | Pemeriksaan | Diuji Daktilitas Pada Suhu 25°C , Kecepatan 5 Cm Per Menit | 20 Menit | Suhu Alat $\pm 25^{\circ}\text{C}$ |

HASIL PEMERIKSAAN

| No. | Benda Uji | Hasil pengujian | Keterangan |
|-----|-----------|-----------------|-------------|
| 1 | Sampel 1 | 164 cm | Tidak putus |
| 2 | Sampel 2 | 164 cm | Tidak putus |

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Lampiran 4 Pemeriksaan Titik Nyala & Titik Bakar Aspal

PEMERIKSAAN TITIK NYALA & BAKAR ASPAL

Material : Aspal Starbit E-55
Sumber : Bintang Djaja, Cilacap
Tanggal Uji : 23 Mei 2019

PERSIAPAN PEMERIKSAAN

| No. | Urutan Pemeriksaan | Pemb. Suhu | Pemb. Waktu |
|-----|---------------------------|------------|-------------|
| 1 | Pemanasan Benda Uji | | |
| | Mulai | 25 °C | 12.00 |
| | Selesai | 130 °C | 12.15 |
| 2 | Didiamkan Pada Suhu Ruang | | |
| | Mulai | 130 °C | 12.15 |
| | Selesai | 25 °C | 12.20 |
| 3 | Diperiksa | | |
| | Mulai | 35 °C | 12.20 |
| | Selesai | 325 °C | 12.45 |


HASIL PENGAMATAN

| No. | Benda Uji | Titik Nyala | Titik Bakar |
|-----|-------------|-------------|-------------|
| 1 | Benda Uji 1 | 312 °C | 325 °C |

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Lampiran 5 Pemeriksaan Penetrasi Aspal


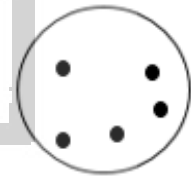
PEMERIKSAAN PENETRASI ASPAL

Material : Aspal Starbit E-55
Sumber : Bintang Djaja, Cilacap
Tanggal Uji : 22 Mei 2019

PERSIAPAN PEMERIKSAAN

| No. | Urutan Pemeriksaan | Pemb. Suhu | Pemb. Waktu |
|-----|---------------------------|------------|-------------|
| 1 | Pemanasan Benda Uji | | |
| | Mulai | 25 °C | 09.00 |
| | Selesai | 130 °C | 09.30 |
| 2 | Didiamkan Pada Suhu Ruang | | |
| | Mulai | 130 °C | 09.30 |
| | Selesai | 25 °C | 11.00 |
| 3 | Diperiksa | | |
| | Mulai | 25 °C | 11.00 |
| | Selesai | 25 °C | 12.30 |


HASIL PENGAMATAN

| No. | Benda Uji | | Sket Pengujian | |
|-------|-----------|--------|--|---|
| | 1 (mm) | 2 (mm) | Benda Uji 1 | Benda Uji 2 |
| 1 | 40 | 41 |  |  |
| 2 | 42 | 43 | | |
| 3 | 44 | 43 | | |
| 4 | 46 | 46 | | |
| 5 | 46 | 45 | | |
| Rata2 | 43,6 | 43,6 | | |

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Lampiran 6 Pemeriksaan Titik Lembek Aspal

PEMERIKSAAN TITIK LEMBEK ASPAL

Material : Aspal Starbit E-55
Sumber : Bintang Djaja, Cilacap
Tanggal Uji : 22 Mei 2019

PERSIAPAN PEMERIKSAAN

| No. | Urutan Pemeriksaan | Pemb. Suhu | Pemb. Waktu |
|-----|---------------------------|------------|-------------|
| 1 | Pemanasan Benda Uji | | |
| | Mulai | 25 °C | 12.10 |
| | Selesai | 50 °C | 12.15 |
| 2 | Didiamkan Pada Suhu Ruang | | |
| | Mulai | 50 °C | 12.15 |
| | Selesai | 25 °C | 12.50 |
| 3 | Diperiksa | | |
| | Mulai | 25 °C | 12.50 |
| | Selesai | 25 °C | 10.34 |

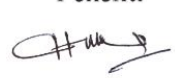
HASIL PENGAMATAN

| No. | Suhu yang diamati | Waktu Pemanasan (Detik) | | Titik Lembek (°C) | |
|-----|-------------------|-------------------------|-------------|-------------------|-------------|
| | | Benda Uji 1 | Benda uji 2 | Benda Uji 1 | Benda Uji 2 |
| 5 | 30 °C | 778 | 778 | | |
| 6 | 35 °C | 883 | 137 | | |
| 7 | 40 °C | 1005 | 1005 | | |
| 8 | 45 °C | 1113 | 1113 | | |
| 9 | 50 °C | 1200 | 1200 | | |
| 10 | 55 °C | 1312 | 1294 | 54,3 | 54 |

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Lampiran 7 Pemeriksaan Kelekatan Agregat Terhadap Aspal

PEMERIKSAAN KELEKATAN AGREGAT TERHADAP ASPAL

Material : Aspal Starbit E-55 dan Agregat ukuran (1/4") dan (3/8")
Sumber : Bintang Djaja, Cilacap
Tanggal Uji : 21 Mei 2019

PERSIAPAN PEMERIKSAAN

| No. | Urutan Pemeriksaan | Pemb. Suhu | Pemb. Waktu |
|-----|---------------------------|------------|-------------|
| 1 | Pemanasan Benda Uji | | |
| | Mulai | 25 °C | 12.10 |
| | Selesai | 150 °C | 12.15 |
| 2 | Didiamkan Pada Suhu Ruang | | |
| | Mulai | 150 °C | 12.15 |
| | Selesai | 25 °C | 12.50 |
| 3 | Diperiksa | | |
| | Mulai | 25 °C | 12.50 |
| | Selesai | 25 °C | 10.34 |


HASIL PEMERIKSAAN

| No. | Benda Uji | % Terselimuti Aspal | Keterangan |
|-----|-------------|---------------------|------------|
| 1 | Benda Uji 1 | 97% | memenuhi |
| 2 | Benda Uji 2 | 99% | memenuhi |
| 3 | Rata-Rata | 98% | memenuhi |

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Lampiran 8 Pemeriksaan Berat Jenis *Filler* Clereng

PEMERIKSAAN BERAT JENIS *FILLER* CLERENG

Material : *Filler* Clereng
Sumber : Clereng, Kulonprogo
Tanggal Uji : 21 Mei 2019

| No. | Pemeriksaan | Sampel | |
|-----|--|--------|-------|
| | | 1 | 2 |
| 1 | Berat <i>Picnometer</i> kosong (gr) | 12,04 | 11,84 |
| 2 | Berat <i>Picnometer</i> + <i>Aquadest</i> (gr) | 29,24 | 29,22 |
| 3 | Berat <i>Aquadest</i> (gr) | 17,2 | 17,38 |
| 4 | Berat <i>Picnometer</i> + <i>Filler</i> (gr) | 13,09 | 13,24 |
| 5 | Berat <i>Filler</i> (gr) | 1,05 | 1,4 |
| 6 | Berat <i>Picnometer</i> + <i>Filler</i> + <i>Aquadest</i> (gr) | 29,88 | 30,07 |
| 7 | Berat <i>Aquadest</i> (gr) | 16,79 | 16,83 |
| 8 | Volume <i>Filler</i> (gr) | 0,41 | 0,55 |
| 9 | Berat Jenis <i>Filler</i> | 2,561 | 2,545 |
| 10 | Rata-rata Berat Jenis <i>Filler</i> | 2,553 | |

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Lampiran 9 Pemeriksaan Berat Jenis *Filler* Serbuk Batu Gamping

PEMERIKSAAN BERAT JENIS *FILLER* SERBUK BATU GAMPING

Material : *Filler* Serbuk Batu Gamping
Sumber : Kulon Progo, Yogyakarta
Tanggal Uji : 21 Mei 2019

| No. | Pemeriksaan | Sampel | |
|-----|--|--------|-------|
| | | 1 | 2 |
| 1 | Berat <i>Vicnometer</i> kosong (gr) | 20,93 | 20,29 |
| 2 | Berat <i>Vicnometer</i> + <i>Aquadest</i> (gr) | 44,35 | 42,6 |
| 3 | Berat <i>Aquadest</i> (gr) | 23,42 | 22,31 |
| 4 | Berat <i>Vicnometer</i> + <i>Filler</i> (gr) | 21,5 | 20,81 |
| 5 | Berat <i>Filler</i> (gr) | 0,57 | 0,52 |
| 6 | Berat <i>Vicnometer</i> + <i>Filler</i> + <i>Aquadest</i> (gr) | 44,68 | 42,89 |
| 7 | Berat <i>Aquadest</i> (gr) | 23,18 | 22,08 |
| 8 | Volume <i>Filler</i> (gr) | 0,24 | 0,23 |
| 9 | Berat Jenis <i>Filler</i> | 2,375 | 2,261 |
| 10 | Rata-rata Berat Jenis <i>Filler</i> | 2,318 | |

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Lampiran 10 Pemeriksaan Berat Jenis Agregat Kasar

PEMERIKSAAN BERAT JENIS AGREGAT KASAR

Material : Agregat Kasar
Sumber : Clereng, Kulonprogo
Tanggal Uji : 20 Mei 2019

| No | Keterangan | Benda Uji (gr) | | |
|----|--|----------------|---------|-----------|
| | | 1 | 2 | Rata-rata |
| 1 | Berat Benda Uji Dalam Keadaan Basah Jenuh (BJ) | 1600,04 | 1619,27 | 1609,66 |
| 2 | Berat Benda Uji Dalam Air (BA) | 1001,14 | 1002,46 | 1001,80 |
| 4 | Berat Benda Uji Kering Oven (BK) | 1574,46 | 1591,42 | 1582,94 |
| 5 | Berat Jenis (<i>Bulk</i>) = $\frac{BK}{BJ-BA}$ | 2,629 | 2,580 | 2,605 |
| 6 | Berat Jenis (<i>SSD</i>) = $\frac{BJ}{BJ-BA}$ | 2,672 | 2,625 | 2,648 |
| 7 | Berat Jenis (Semu) = $\frac{BK}{BK-BA}$ | 2,746 | 2,702 | 2,724 |
| 8 | Penyerapan Air = $\frac{BK}{BK-BA} \times 100\%$ | 1,625 | 1,750 | 1,687 |

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Lampiran 11 Pemeriksaan Berat Jenis Agregat Halus

PEMERIKSAAN BERAT JENIS AGREGAT HALUS


Material : Agregat Halus
Sumber : Clereng, Kulonprogo
Tanggal Uji : 20 Mei 2019

| No. | Keterangan | Benda Uji (gr) | | |
|-----|---|----------------|--------|-----------|
| | | 1 | 2 | Rata-rata |
| 1 | Berat Benda Uji Dalam Keadaan Basah Jenuh (BJ) | 500 | 500,05 | 500,03 |
| 2 | Berat <i>Vicnometer</i> + Air (B) | 690,4 | 658,71 | 674,555 |
| 3 | Berat <i>Vicnometer</i> + Air + Benda Uji (BT) | 992,3 | 969,21 | 980,755 |
| 4 | Berat Benda Uji Kering Oven (BK) | 488,21 | 488,83 | 488,52 |
| 5 | Berat Jenis (<i>Bulk</i>) = $\frac{BK}{(B+500)-BT}$ | 2,46 | 2,58 | 2,52 |
| 6 | Berat Jenis (<i>SSD</i>) = $\frac{500}{(B+500)-BT}$ | 2,52 | 2,64 | 2,52 |
| 7 | Berat Jenis (Semu) = $\frac{BK}{(B+BK)-BT}$ | 2,62 | 2,74 | 2,68 |
| 8 | Penyerapan Air = $\frac{(500-BK)}{BK} \times 100\%$ | 2,41 | 2,29 | 2,35 |

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Lampiran 12 Pemeriksaan *Sand Equivalent*

PEMERIKSAAN SAND EQUIVALENT

Material : Agregat Halus
Sumber : Clereng, Kulonprogo
Tanggal Uji : 20 Mei 2019

| No. | Keterangan | Benda Uji (gr) | | |
|-----|--|----------------|---------|---------|
| | | 1 | 2 | |
| 1 | Persiapan dan Perendaman Benda Uji Dalam Larutan CaCl ₂ selama (± 10 menit) | Mulai | 13,33 | 13,3 |
| | | Selesai | 13,43 | 13,45 |
| 2 | Waktu Pengendapan (Benda Uji setelah di gojok sebanyak 90x, dan ditambah larutan CaCl ₂) | Mulai | 13,50 | 13,50 |
| | | Selesai | 14 | 14,05 |
| 3 | <i>Clay Reading</i> (Pembacaan Lumpur) Inchi | | 3,9 | 3,6 |
| 4 | <i>Sand Reading</i> (Pembacaan Pasir) | | 3,6 | 3,3 |
| 5 | $Sand Equivalent = \frac{Sand\ reading}{Clay\ reading} \times 100$ | | 92,31% | 91,67 % |
| 6 | Rata-rata <i>Sand Equivalent</i> (%) | | 91,98 % | |

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Lampiran 13 Pemeriksaan Keausan Agregat

PEMERIKSAAN KEAUSAN AGREGAT (*ABRASI TEST*)

Material : Agregat Kasar
Sumber : Clereng, Kulonprogo
Tanggal Uji : 20 Mei 2019

| No. | Jenis Gradasi | | Seragam (AC-WC) | |
|-----|--|---------------|-----------------|-------|
| | Saringan | | Benda Uji | |
| | Lolos | Tertahan | 1 | 2 |
| 1 | 25,4 mm 1 " | 19 mm 3/4 " | 2500 | 2500 |
| 2 | 19 mm 3/4 " | 12,5 mm 1/2 " | 2500 | 2500 |
| 3 | 12,5 mm 1/2 " | 9,5 mm 3/8 " | | |
| 4 | Jumlah Benda Uji (A) (gr) | | 5000 | 4711 |
| 5 | Jumlah Tertahan Di <i>Sieve</i> 12(B) (gr) | | 4711 | 3752 |
| 6 | Keausan = $(A-B)/A \times 100\%$ (%) | | 5,78 | 20,36 |
| 7 | Rata-rata Keausan (%) | | 13,07 | |

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Lampiran 14 Pengujian *Marshall* dalam Mencari KAO Kadar *Filler* Pengganti Serbuk Batu Gamping 0%

PENGUJIAN MARSHALL DALAM MENCARI KAO KADAR *FILLER* PENGGANTI SERBUK BATU GAMPING 0%

Tanggal Pengujian :
Tipe Campuran : *Asphalt Concrete – Wearing Course (AC-WC) Gradasi Superpave*

Dikerjakan Oleh : Bagas Novika Ardi
Diperiksa Oleh : Berlian Kushari, ST., M.Eng.

| Sampel | Tinggi | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|--------|--------|------|-----|---------|---------|--------|--------|--------------|-------|--------|---------|-------|--------------|--------------|-------------|------|---------|---------|-----------------|-------------|---------------|
| | (cm) | (%) | (%) | (gram) | (gram) | (gram) | (gram) | Density | | | | | VMA (%) | VFWA (%) | VITM (%) | Meas | | Koreksi | Stabilitas (kg) | Flow (mm) | MQ (Kg/mm) |
| 5A | 65.30 | 5.26 | 5 | 1179.31 | 1189.17 | 663.72 | 525.45 | 2.244 | 2.433 | 10.478 | 81.7817 | 7.740 | 18.22 | 57.51 | 7.74 | 88 | 1749.90 | 0.96 | 1688.51 | 2.70 | 625.37 |
| 5B | 66.00 | 5.26 | 5 | 1169.42 | 1181.08 | 660.83 | 520.25 | 2.248 | 2.433 | 10.494 | 81.9064 | 7.600 | 18.09 | 58.00 | 7.60 | 83 | 1650.47 | 0.95 | 1563.82 | 2.80 | 558.51 |
| 5C | 67.00 | 5.26 | 5 | 1167.98 | 1176.04 | 658.79 | 517.25 | 2.258 | 2.433 | 10.542 | 82.28 | 7.178 | 17.72 | 59.49 | 7.18 | 87 | 1730.01 | 0.91 | 1578.64 | 2.70 | 584.68 |
| | | | | | | | | 2.250 | | | | | 18.01 | 58.33 | 7.51 | | | | 1610.32 | 2.73 | 589.52 |
| 5.5A | 66.14 | 5.82 | 5.5 | 1181.7 | 1194.19 | 670.01 | 524.18 | 2.254 | 2.417 | 11.577 | 81.7136 | 6.709 | 18.29 | 63.31 | 6.71 | 90 | 1789.67 | 0.94 | 1673.70 | 2.80 | 597.75 |
| 5.5B | 65.67 | 5.82 | 5.5 | 1170.99 | 1182.16 | 666.3 | 515.86 | 2.270 | 2.417 | 11.657 | 82.279 | 6.064 | 17.72 | 65.78 | 6.06 | 83 | 1650.47 | 0.94 | 1550.41 | 2.80 | 553.72 |
| 5.5C | 64.33 | 5.82 | 5.5 | 1167.63 | 1177.49 | 665.2 | 512.29 | 2.279 | 2.417 | 11.705 | 82.6146 | 5.681 | 17.39 | 67.33 | 5.68 | 86 | 1710.13 | 0.96 | 1649.20 | 2.75 | 599.71 |
| | | | | | | | | 2.268 | | | | | 17.80 | 65.47 | 6.15 | | | | 1624.44 | 2.78 | 583.73 |
| 6A | 0.00 | 6.38 | 6 | 1177.82 | 1190.98 | 675.01 | 515.97 | 2.283 | 2.401 | 12.788 | 82.3035 | 4.908 | 17.70 | 72.27 | 4.91 | 82 | 1630.59 | 0.91 | 1490.36 | 2.85 | 522.93 |
| 6B | 0.00 | 6.38 | 6 | 1164.83 | 1173.33 | 661.02 | 512.31 | 2.274 | 2.401 | 12.738 | 81.9773 | 5.285 | 18.02 | 70.68 | 5.29 | 95 | 1889.09 | 0.94 | 1769.84 | 2.70 | 655.50 |
| 6C | 0.00 | 6.38 | 6 | 1166.08 | 1188.33 | 680.42 | 507.91 | 2.296 | 2.401 | 12.862 | 82.7762 | 4.362 | 17.22 | 74.67 | 4.36 | 96 | 1908.98 | 0.97 | 1853.30 | 2.90 | 639.07 |
| | | | | | | | | 2.284 | | | | | 17.65 | 72.54 | 4.85 | | | | 1704.50 | 2.82 | 605.83 |
| 6.5A | 0.00 | 6.95 | 6.5 | 1152.33 | 1161.75 | 655.2 | 506.55 | 2.275 | 2.385 | 13.806 | 81.5834 | 4.610 | 18.42 | 74.97 | 4.61 | 84 | 1670.36 | 0.98 | 1637.89 | 2.90 | 564.79 |
| 6.5B | 0.00 | 6.95 | 6.5 | 1155.58 | 1163.9 | 656.39 | 507.51 | 2.277 | 2.385 | 13.819 | 81.6588 | 4.522 | 18.34 | 75.34 | 4.52 | 91 | 1809.55 | 0.97 | 1763.18 | 3.20 | 550.99 |
| 6.5C | 0.00 | 6.95 | 6.5 | 1150.65 | 1158.93 | 653.56 | 505.37 | 2.277 | 2.385 | 13.818 | 81.6547 | 4.527 | 18.35 | 75.32 | 4.53 | 86 | 1710.13 | 0.99 | 1687.33 | 2.90 | 581.84 |
| | | | | | | | | 2.276 | | | | | 18.37 | 75.21 | 4.55 | | | | 1696.13 | 3.00 | 565.87 |
| 7A | 0.00 | 7.53 | 7 | 1163.58 | 1172.04 | 663.71 | 508.33 | 2.289 | 2.369 | 14.961 | 81.6525 | 3.387 | 18.35 | 81.54 | 3.39 | 95 | 1889.09 | 0.93 | 1748.20 | 3.70 | 472.49 |
| 7B | 0.00 | 7.53 | 7 | 1155.6 | 1162.42 | 655.86 | 506.56 | 2.281 | 2.369 | 14.910 | 81.3758 | 3.714 | 18.62 | 80.06 | 3.71 | 90 | 1789.67 | 0.97 | 1733.00 | 3.30 | 525.15 |
| 7C | 0.00 | 7.53 | 7 | 1136.92 | 1147.48 | 650.07 | 497.41 | 2.286 | 2.369 | 14.939 | 81.5331 | 3.528 | 18.47 | 80.90 | 3.53 | 105 | 2087.95 | 1.04 | 2171.46 | 3.35 | 648.20 |
| | | | | | | | | 2.285 | | | | | 18.48 | 80.83 | 3.54 | | | | 1884.22 | 3.45 | 548.61 |

Mengetahui,
Ka. Lab. Jalan Raya

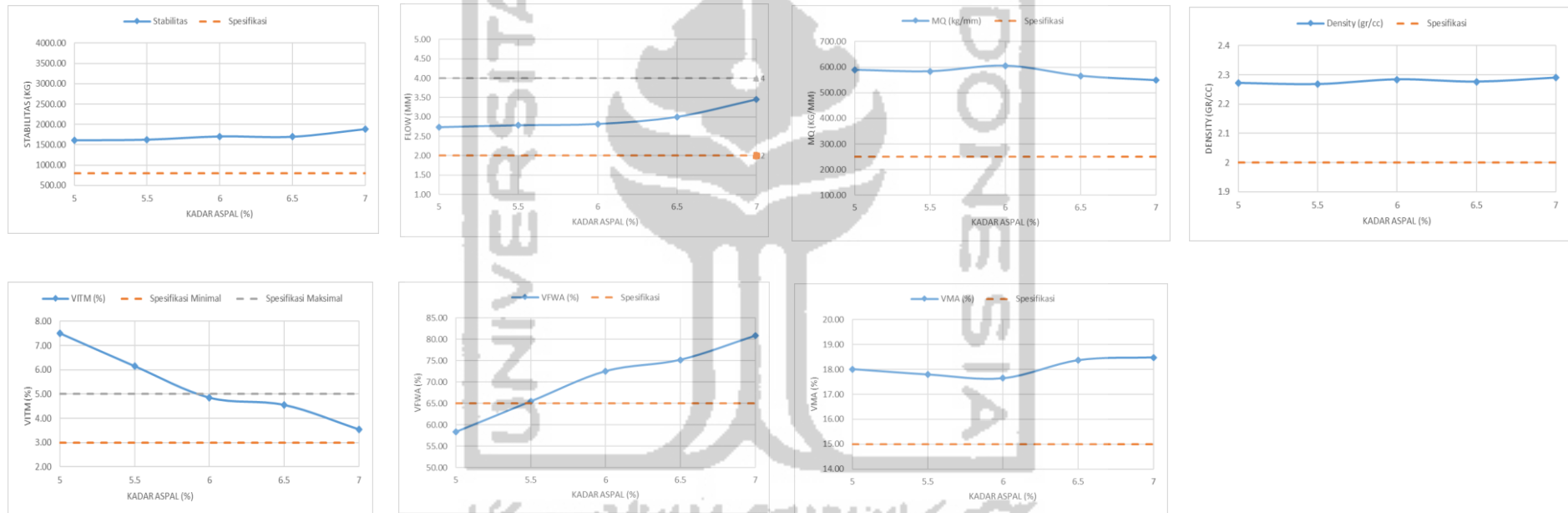
Ir. Subarkah, M.T

Peneliti

Bagas Novika Ardi
15511252

Lampiran 15 Grafik Pengujian *Marshall* dalam Mencari KAO Kadar *Filler* Pengganti Serbuk Batu Gamping 0%

GRAFIK PENGUJIAN MARSHALL DALAM MENCARI KAO KADAR *FILLER* PENGGANTI SERBUK BATU GAMPING 0%





Lampiran 16 Pengujian Marshall dalam Mencari KAO Kadar Filler Pengganti Serbuk Batu Gamping 25%

PENGUJIAN MARSHALL DALAM MENCARI KAO KADAR FILLER PENGGANTI SERBUK BATU GAMPING 25%

Tanggal Pengujian :
Tipe Campuran : Asphalt Concrete – Wearing Course (AC-WC) Gradasi Superpave

Dikerjakan Oleh : Bagas Novika Ardi
Diperiksa Oleh : Berlian Kushari, ST., M.Eng.

| Sampel | Tinggi (cm) | A (%) | B (%) | C (gram) | D (gram) | E (gram) | F (gram) | G Density | H | I | J | K | L | M | N | O Meas | P | Q | R | S | T |
|--------|----------------|----------|----------|-------------|-------------|-------------|-------------|--------------|-------|--------|---------|-------|--------------|--------------|-------------|-----------|---------|---------|-----------------|-------------|---------------|
| | | | | | | | | | | | | | VMA (%) | VFWA (%) | VITM (%) | | | Koreksi | Stabilitas (kg) | Flow (mm) | MQ (Kg/mm) |
| 5A | 66.62 | 5.26 | 5 | 1163.13 | 1172.25 | 654.57 | 517.68 | 2.247 | 2.429 | 10.489 | 81.9996 | 7.511 | 18.00 | 58.27 | 7.51 | 90 | 1789.67 | 0.93 | 1667.08 | 2.85 | 584.94 |
| 5B | 68.61 | 5.26 | 5 | 1178.32 | 1187.19 | 662.37 | 524.82 | 2.245 | 2.429 | 10.482 | 81.9404 | 7.578 | 18.06 | 58.04 | 7.58 | 85 | 1690.24 | 0.88 | 1494.60 | 2.65 | 564.00 |
| 5C | 67.23 | 5.26 | 5 | 1180.01 | 1187.39 | 664.63 | 522.76 | 2.257 | 2.429 | 10.538 | 82.3813 | 7.081 | 17.62 | 59.81 | 7.08 | 92 | 1829.44 | 0.92 | 1677.14 | 2.75 | 609.87 |
| | | | | | | | | 2.250 | | | | | 17.89 | 58.71 | 7.39 | | | | 1612.94 | 2.75 | 586.27 |
| 5.5A | 63.76 | 5.82 | 5.5 | 1172.95 | 1179.16 | 662.96 | 516.20 | 2.272 | 2.413 | 11.669 | 82.4926 | 5.838 | 17.51 | 66.65 | 5.84 | 90 | 1789.67 | 0.99 | 1778.18 | 2.60 | 683.92 |
| 5.5B | 63.83 | 5.82 | 5.5 | 1173.07 | 1180.16 | 661.53 | 518.63 | 2.262 | 2.413 | 11.616 | 82.1144 | 6.270 | 17.89 | 64.94 | 6.27 | 88 | 1749.90 | 0.99 | 1735.61 | 2.90 | 598.49 |
| 5.5C | 69.61 | 5.82 | 5.5 | 1171.84 | 1180.56 | 662.12 | 518.44 | 2.260 | 2.413 | 11.608 | 82.0584 | 6.334 | 17.94 | 64.70 | 6.33 | 86 | 1710.13 | 0.87 | 1480.12 | 2.95 | 501.73 |
| | | | | | | | | 2.265 | | | | | 17.78 | 65.43 | 6.15 | | | | 1664.64 | 2.82 | 594.71 |
| 6A | 63.17 | 6.38 | 6 | 1171.00 | 1177.82 | 662.45 | 515.37 | 2.272 | 2.397 | 12.729 | 82.0516 | 5.219 | 17.95 | 70.92 | 5.22 | 92 | 1829.44 | 1.01 | 1844.68 | 3.20 | 576.46 |
| 6B | 64.49 | 6.38 | 6 | 1166.57 | 1172.38 | 660.66 | 511.72 | 2.280 | 2.397 | 12.771 | 82.3242 | 4.904 | 17.68 | 72.25 | 4.90 | 95 | 1889.09 | 0.98 | 1842.34 | 2.65 | 695.22 |
| 6C | 65.72 | 6.38 | 6 | 1179.66 | 1186.96 | 667.89 | 519.07 | 2.273 | 2.397 | 12.732 | 82.0692 | 5.199 | 17.93 | 71.01 | 5.20 | 83 | 1650.47 | 0.95 | 1565.37 | 3.75 | 417.43 |
| | | | | | | | | 2.275 | | | | | 17.85 | 71.39 | 5.11 | | | | 1750.80 | 3.20 | 563.04 |
| 6.5A | 64.04 | 6.95 | 6.5 | 1168.84 | 1174.9 | 661.57 | 513.33 | 2.277 | 2.382 | 13.819 | 81.7884 | 4.392 | 18.21 | 75.88 | 4.39 | 89 | 1769.78 | 0.99 | 1745.74 | 3.60 | 484.93 |
| 6.5B | 64.24 | 6.95 | 6.5 | 1176.68 | 1180.36 | 663.76 | 516.60 | 2.278 | 2.382 | 13.824 | 81.8158 | 4.360 | 18.18 | 76.02 | 4.36 | 82 | 1630.59 | 0.98 | 1600.28 | 3.55 | 450.78 |
| 6.5C | 62.79 | 6.95 | 6.5 | 1170.18 | 1177.11 | 661.42 | 515.69 | 2.269 | 2.382 | 13.772 | 81.5074 | 4.721 | 18.49 | 74.47 | 4.72 | 87 | 1730.01 | 1.02 | 1760.86 | 3.65 | 482.43 |
| | | | | | | | | 2.275 | | | | | 18.30 | 75.46 | 4.49 | | | | 1702.30 | 3.60 | 472.71 |
| 7A | 66.01 | 7.53 | 7 | 1172.69 | 1176.41 | 661.36 | 515.05 | 2.277 | 2.366 | 14.881 | 81.3464 | 3.772 | 18.65 | 79.78 | 3.77 | 88 | 1749.90 | 0.94 | 1650.15 | 3.40 | 485.34 |
| 7B | 63.44 | 7.53 | 7 | 1176.29 | 1181.74 | 666.31 | 515.43 | 2.282 | 2.366 | 14.916 | 81.5359 | 3.548 | 18.46 | 80.78 | 3.55 | 80 | 1590.82 | 1.00 | 1593.33 | 3.95 | 403.38 |
| 7C | 62.78 | 7.53 | 7 | 1157.6 | 1162.24 | 657.38 | 504.86 | 2.293 | 2.366 | 14.986 | 81.9204 | 3.093 | 18.08 | 82.89 | 3.09 | 84 | 1670.36 | 1.02 | 1700.42 | 3.70 | 459.57 |
| | | | | | | | | 2.284 | | | | | 18.40 | 81.15 | 3.47 | | | | 1647.97 | 3.68 | 449.43 |

Mengetahui,
K. Lab. Jalan Raya

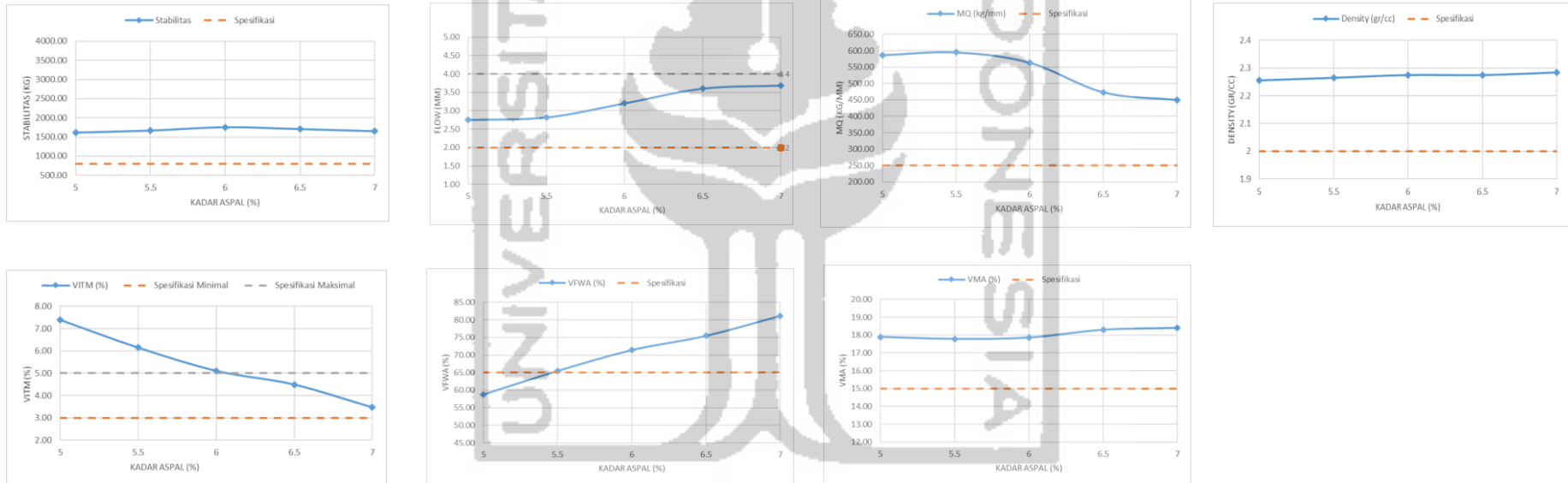
Ir. Subarkah, M.T

Peneliti

Bagas Novika Ardi
15511252

Lampiran 17 Grafik Pengujian *Marshall* dalam Mencari KAO Kadar *Filler* Pengganti Serbuk Batu Gamping 25%

GRAFIK PENGUJIAN MARSHALL DALAM MENCARI KAO KADAR *FILLER* PENGGANTI SERBUK BATU GAMPING 25%





Lampiran 18 Pengujian *Marshall* dalam Mencari KAO Kadar *Filler* Pengganti Serbuk Batu Gamping 50%

PENGUJIAN MARSHALL DALAM MENCARI KAO KADAR FILLER PENGGANTI SERBUK BATU GAMPING 50%

Tanggal Pengujian :
Tipe Campuran : Asphalt Concrete – Wearing Course (AC-WC) Gradasi Superpave

Dikerjakan Oleh : Bagas Novika Ardi
Diperiksa Oleh : Berlian Kushari, ST., M.Eng.

| Sampel | Tinggi (cm) | A (%) | B (%) | C (gram) | D (gram) | E (gram) | F (gram) | G Density | H | I | J | K | L | M | N | O Meas | P | Q | R | S | T |
|--------|-------------|-------|-------|----------|----------|----------|----------|--------------|-------|--------|---------|-------|--------------|--------------|-------------|--------|---------|---------|-----------------|-------------|---------------|
| | | | | | | | | | | | | | VMA (%) | VFWA (%) | VITM (%) | | | Koreksi | Stabilitas (kg) | Flow (mm) | MQ (Kg/mm) |
| 5A | 73,39 | 5,26 | 5 | 1167,25 | 1174,59 | 653,76 | 520,83 | 2,241 | 2,426 | 10,463 | 81,9218 | 7,615 | 18,08 | 57,88 | 7,62 | 90 | 1789,67 | 0,80 | 1436,43 | 3,00 | 478,81 |
| 5B | 69,45 | 5,26 | 5 | 1148,47 | 1154,46 | 645,22 | 509,24 | 2,255 | 2,426 | 10,529 | 82,4383 | 7,033 | 17,56 | 59,95 | 7,03 | 86 | 1710,13 | 0,87 | 1485,25 | 3,20 | 464,14 |
| 5C | 66,94 | 5,26 | 5 | 1175,18 | 1179,85 | 655,66 | 524,19 | 2,242 | 2,426 | 10,466 | 81,9497 | 7,584 | 18,05 | 57,98 | 7,58 | 92 | 1829,44 | 0,92 | 1690,55 | 2,62 | 645,25 |
| | | | | | | | | 2,246 | | | | | 17,90 | 58,60 | 7,41 | | | | 1537,41 | 2,94 | 529,40 |
| 5,5A | 68,60 | 5,82 | 5,5 | 1160,06 | 1170,41 | 658,41 | 512,00 | 2,266 | 2,410 | 11,635 | 82,3854 | 5,979 | 17,61 | 66,06 | 5,98 | 101 | 2008,41 | 0,88 | 1776,18 | 2,90 | 612,48 |
| 5,5B | 67,27 | 5,82 | 5,5 | 1169,82 | 1177,26 | 660,71 | 516,55 | 2,265 | 2,410 | 11,630 | 82,3468 | 6,023 | 17,65 | 65,88 | 6,02 | 85 | 1690,24 | 0,92 | 1547,98 | 3,40 | 455,29 |
| 5,5C | 68,20 | 5,82 | 5,5 | 1164,55 | 1175,07 | 658,9 | 516,17 | 2,256 | 2,410 | 11,586 | 82,0362 | 6,378 | 17,96 | 64,50 | 6,38 | 88 | 1749,90 | 0,89 | 1561,78 | 3,00 | 520,59 |
| | | | | | | | | 2,262 | | | | | 17,74 | 65,48 | 6,13 | | | | 1628,65 | 3,10 | 529,45 |
| 6A | 66,13 | 6,38 | 6 | 1170,73 | 1177,39 | 661,32 | 516,07 | 2,269 | 2,394 | 12,709 | 82,051 | 5,240 | 17,95 | 70,81 | 5,24 | 94 | 1869,21 | 0,94 | 1758,22 | 3,30 | 532,80 |
| 6B | 69,97 | 6,38 | 6 | 1171,87 | 1181,37 | 665,39 | 515,98 | 2,271 | 2,394 | 12,724 | 82,1453 | 5,131 | 17,85 | 71,26 | 5,13 | 85 | 1690,24 | 0,86 | 1451,35 | 3,40 | 426,87 |
| 6C | 68,45 | 6,38 | 6 | 1186,62 | 1198,91 | 674,07 | 524,84 | 2,261 | 2,394 | 12,666 | 81,775 | 5,559 | 18,22 | 69,50 | 5,56 | 129 | 2565,19 | 0,89 | 2275,81 | 3,33 | 683,42 |
| | | | | | | | | 2,267 | | | | | 18,01 | 70,52 | 5,31 | | | | 1828,46 | 3,34 | 547,70 |
| 6,5A | 66,07 | 6,95 | 6,5 | 1170,77 | 1180,34 | 665,1 | 515,24 | 2,272 | 2,378 | 13,791 | 81,7489 | 4,460 | 18,25 | 75,56 | 4,46 | 95 | 1889,09 | 0,94 | 1779,29 | 3,30 | 539,18 |
| 6,5B | 64,17 | 6,95 | 6,5 | 1173,94 | 1182,4 | 666,54 | 515,86 | 2,276 | 2,378 | 13,811 | 81,8717 | 4,317 | 18,13 | 76,19 | 4,32 | 90 | 1789,67 | 0,98 | 1759,84 | 3,55 | 495,73 |
| 6,5C | 67,65 | 6,95 | 6,5 | 1184,11 | 1193,26 | 672,96 | 520,30 | 2,276 | 2,378 | 13,812 | 81,8763 | 4,312 | 18,12 | 76,21 | 4,31 | 83 | 1650,47 | 0,91 | 1495,88 | 3,45 | 433,59 |
| | | | | | | | | 2,275 | | | | | 18,17 | 75,99 | 4,36 | | | | 1678,34 | 3,43 | 489,50 |
| 7A | 65,87 | 7,53 | 7 | 1168,68 | 1178,35 | 662,66 | 515,69 | 2,266 | 2,363 | 14,812 | 81,0957 | 4,092 | 18,90 | 78,35 | 4,09 | 90 | 1789,67 | 0,95 | 1692,35 | 3,50 | 483,53 |
| 7B | 65,73 | 7,53 | 7 | 1175,62 | 1181,81 | 663,46 | 518,35 | 2,268 | 2,363 | 14,824 | 81,1587 | 4,018 | 18,84 | 78,68 | 4,02 | 84 | 1670,36 | 0,95 | 1583,71 | 3,50 | 452,49 |
| 7C | 68,49 | 7,53 | 7 | 1171,07 | 1179,76 | 663,11 | 516,65 | 2,267 | 2,363 | 14,815 | 81,1106 | 4,075 | 18,89 | 78,43 | 4,07 | 95 | 1889,09 | 0,89 | 1674,45 | 3,40 | 492,48 |
| | | | | | | | | 2,267 | | | | | 18,88 | 78,49 | 4,06 | | | | 1650,17 | 3,47 | 476,17 |

Mengetahui,
K. Ka. Lab. Jalan Raya

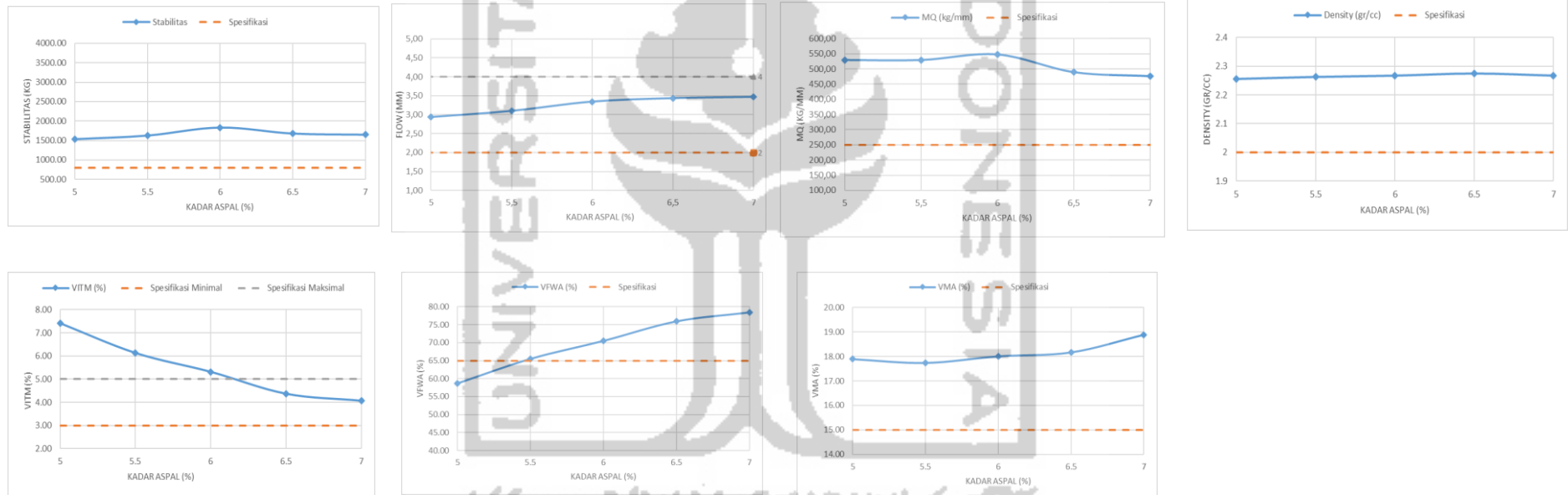
Ir. Subarkah, M.T

Peneliti

Bagas Novika Ardi
15511252

Lampiran 19 Grafik Pengujian *Marshall* dalam Mencari KAO Kadar *Filler* Pengganti Serbuk Batu Gamping 50%

GRAFIK PENGUJIAN MARSHALL DALAM MENCARI KAO KADAR *FILLER* PENGGANTI SERBUK BATU GAMPING 50%





Lampiran 20 Pengujian *Marshall* dalam Mencari KAO Kadar *Filler* Pengganti Serbuk Batu Gamping 75%

PENGUJIAN MARSHALL DALAM MENCARI KAO KADAR *FILLER* PENGGANTI SERBUK BATU GAMPING 75%

Tanggal Pengujian :
Tipe Campuran : *Asphalt Concrete – Wearing Course (AC-WC) Gradasi Superpave*

Dikerjakan Oleh : Bagas Novika Ardi
Diperiksa Oleh : Berlian Kushari, ST., M.Eng.

| Sampel | Tinggi | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|--------|--------|------|-----|---------|---------|--------|--------|--------------|-------|--------|---------|-------|--------------|--------------|-------------|------|---------|---------|-----------------|-------------|---------------|
| | (cm) | (%) | (%) | (gram) | (gram) | (gram) | (gram) | Density | | | | | VMA (%) | VFWA (%) | VITM (%) | Meas | | Koreksi | Stabilitas (kg) | Flow (mm) | MQ (Kg/mm) |
| 5A | 67,99 | 5,26 | 5 | 1173,88 | 1183,96 | 664,38 | 519,58 | 2,259 | 2,422 | 10,548 | 82,7162 | 6,736 | 17,28 | 61,03 | 6,74 | 65 | 1292,54 | 0,90 | 1160,27 | 3,10 | 374,28 |
| 5B | 71,74 | 5,26 | 5 | 1166,7 | 1177,97 | 654,81 | 523,16 | 2,230 | 2,422 | 10,411 | 81,6477 | 7,941 | 18,35 | 56,73 | 7,94 | 75 | 1491,39 | 0,83 | 1231,45 | 3,15 | 390,94 |
| 5C | 69,05 | 5,26 | 5 | 1171,56 | 1180,26 | 662,64 | 517,62 | 2,263 | 2,422 | 10,567 | 82,8654 | 6,568 | 17,13 | 61,67 | 6,57 | 73 | 1451,62 | 0,88 | 1271,53 | 2,90 | 438,46 |
| | | | | | | | | 2,251 | | | | | 17,59 | 59,81 | 7,08 | | | | 1221,08 | 3,05 | 401,23 |
| 5.5A | 67,26 | 5,82 | 5,5 | 1174,24 | 1183,01 | 661,94 | 521,07 | 2,254 | 2,406 | 11,573 | 82,0708 | 6,357 | 17,93 | 64,55 | 6,36 | 68 | 1352,19 | 0,92 | 1238,61 | 3,20 | 387,07 |
| 5.5B | 67,27 | 5,82 | 5,5 | 1171,39 | 1181,63 | 662,86 | 518,77 | 2,258 | 2,406 | 11,596 | 82,2346 | 6,170 | 17,77 | 65,27 | 6,17 | 68 | 1352,19 | 0,92 | 1238,27 | 3,00 | 412,76 |
| 5.5C | 67,37 | 5,82 | 5,5 | 1161,36 | 1171,33 | 659,65 | 511,68 | 2,270 | 2,406 | 11,656 | 82,6601 | 5,684 | 17,34 | 67,22 | 5,68 | 67 | 1332,31 | 0,91 | 1216,84 | 3,15 | 386,30 |
| | | | | | | | | 2,260 | | | | | 17,68 | 65,68 | 6,07 | | | | 1231,24 | 3,12 | 395,37 |
| 6A | 66,99 | 6,38 | 6 | 1165,76 | 1178,2 | 666,25 | 511,95 | 2,277 | 2,391 | 12,757 | 82,4908 | 4,752 | 17,51 | 72,86 | 4,75 | 70 | 1391,96 | 0,92 | 1284,43 | 3,40 | 377,77 |
| 6B | 67,35 | 6,38 | 6 | 1158,65 | 1170 | 657,81 | 512,19 | 2,262 | 2,391 | 12,673 | 81,9492 | 5,378 | 18,05 | 70,21 | 5,38 | 68 | 1352,19 | 0,91 | 1235,68 | 3,60 | 343,24 |
| 6C | 68,45 | 6,38 | 6 | 1186,62 | 1198,91 | 672,07 | 526,84 | 2,252 | 2,391 | 12,618 | 81,5937 | 5,788 | 18,41 | 68,55 | 5,79 | 68 | 1352,19 | 0,90 | 1213,17 | 3,35 | 362,14 |
| | | | | | | | | 2,264 | | | | | 17,99 | 70,54 | 5,31 | | | | 1244,43 | 3,45 | 361,05 |
| 6.5A | 66,16 | 6,95 | 6,5 | 1173,37 | 1183,68 | 668,95 | 514,73 | 2,280 | 2,375 | 13,835 | 82,1416 | 4,023 | 17,86 | 77,47 | 4,02 | 64 | 1272,65 | 0,94 | 1196,53 | 3,65 | 327,82 |
| 6.5B | 65,36 | 6,95 | 6,5 | 1159,27 | 1170,89 | 664,21 | 506,68 | 2,288 | 2,375 | 13,886 | 82,4439 | 3,670 | 17,56 | 79,09 | 3,67 | 67 | 1332,31 | 0,96 | 1272,44 | 3,55 | 358,43 |
| 6.5C | 67,65 | 6,95 | 6,5 | 1184,11 | 1195,26 | 672,96 | 522,30 | 2,267 | 2,375 | 13,759 | 81,692 | 4,549 | 18,31 | 75,15 | 4,55 | 65 | 1292,54 | 0,90 | 1158,54 | 3,35 | 345,83 |
| | | | | | | | | 2,278 | | | | | 17,91 | 77,24 | 4,08 | | | | 1209,17 | 3,52 | 344,03 |
| 7A | 66,65 | 7,53 | 7 | 1163,78 | 1173,84 | 665,4 | 508,44 | 2,289 | 2,360 | 14,960 | 82,037 | 3,003 | 17,96 | 83,28 | 3,00 | 60 | 1193,11 | 0,93 | 1110,79 | 3,60 | 308,55 |
| 7B | 67,08 | 7,53 | 7 | 1172,53 | 1181,99 | 666,79 | 515,20 | 2,276 | 2,360 | 14,875 | 81,5693 | 3,556 | 18,43 | 80,71 | 3,56 | 72 | 1431,73 | 0,92 | 1318,03 | 3,70 | 356,22 |
| 7C | 68,49 | 7,53 | 7 | 1171,07 | 1179,76 | 664,11 | 515,65 | 2,271 | 2,360 | 14,844 | 81,3967 | 3,760 | 18,60 | 79,79 | 3,76 | 62 | 1232,88 | 0,88 | 1078,98 | 3,65 | 295,61 |
| | | | | | | | | 2,279 | | | | | 18,33 | 81,26 | 3,44 | | | | 1169,27 | 3,65 | 320,13 |

Mengetahui,
K. Lab. Jalan Raya

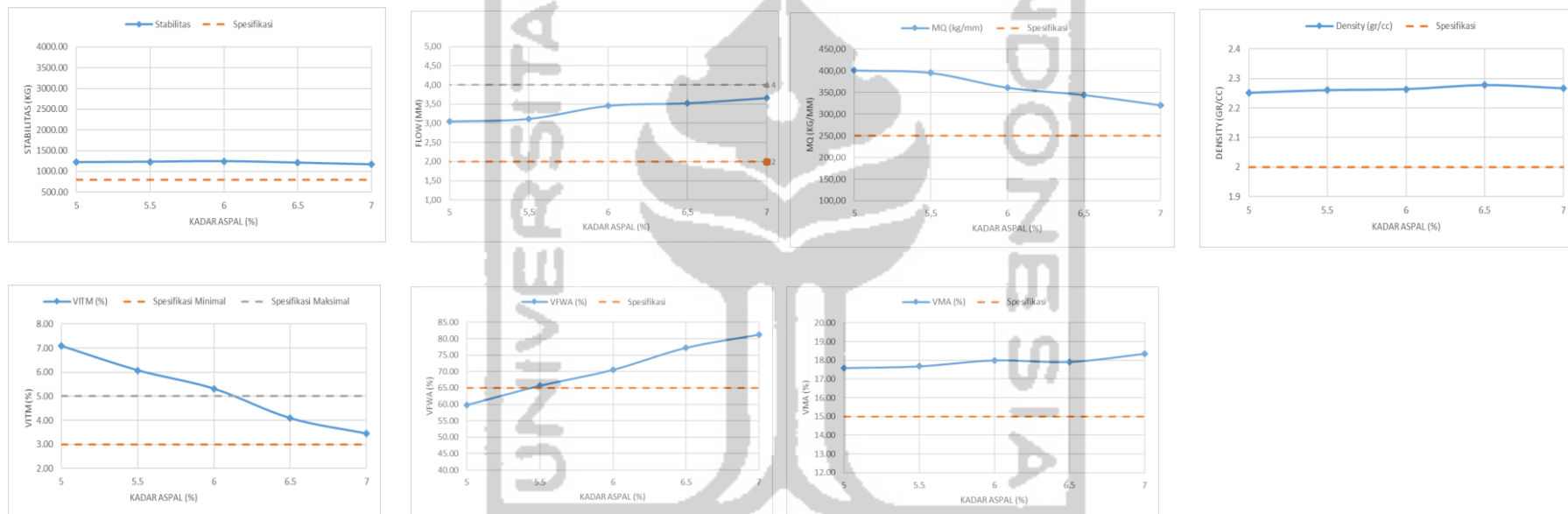
Ir. Subarkah, M.T

Peneliti

Bagas Novika Ardi
15511252

Lampiran 21 Grafik Pengujian *Marshall* dalam Mencari KAO Kadar *Filler* Pengganti Serbuk Batu Gamping

GRAFIK PENGUJIAN MARSHALL DALAM MENCARI KAO KADAR *FILLER* PENGGANTI SERBUK BATU GAMPING 75%





Lampiran 22 Pengujian *Marshall* dalam Mencari KAO Kadar *Filler* Pengganti Serbuk Batu Gamping 100%

PENGUJIAN MARSHALL DALAM MENCARI KAO KADAR FILLER PENGGANTI SERBUK BATU GAMPING 100%

Tanggal Pengujian :
Tipe Campuran : *Asphalt Concrete – Wearing Course (AC-WC) Gradasi Superpave*

Dikerjakan Oleh : Bagas Novika Ardi
Diperiksa Oleh : Berlian Kushari, ST., M.Eng.

| Sampel | Tinggi (cm) | A (%) | B (%) | C (gram) | D (gram) | E (gram) | F (gram) | G Density | H | I | J | K | L VMA (%) | M VFWA (%) | N VITM (%) | O Meas | P | Q Koreksi | R Stabilitas (kg) | S Flow (mm) | T MQ (Kg/mm) |
|--------|----------------|----------|----------|-------------|-------------|-------------|-------------|--------------|-------|--------|---------|-------|--------------|---------------|---------------|-----------|---------|--------------|----------------------|----------------|-----------------|
| | | | | | | | | | | | | | | | | | | | | | |
| 5A | 67,80 | 5,26 | 5 | 1183,01 | 1194,2 | 667,15 | 527,05 | 2,245 | 2,419 | 10,479 | 82,3086 | 7,213 | 17,69 | 59,23 | 7,21 | 64 | 1272,65 | 0,90 | 1148,57 | 3,20 | 358,93 |
| 5B | 69,00 | 5,26 | 5 | 1168,63 | 1183,56 | 662,53 | 521,03 | 2,243 | 2,419 | 10,471 | 82,2475 | 7,281 | 17,75 | 58,98 | 7,28 | 61 | 1213,00 | 0,88 | 1063,65 | 3,00 | 354,55 |
| 5C | 69,05 | 5,26 | 5 | 1166,7 | 1177,97 | 661,81 | 516,16 | 2,260 | 2,419 | 10,553 | 82,8864 | 6,561 | 17,11 | 61,66 | 6,56 | 73 | 1451,62 | 0,88 | 1271,53 | 3,15 | 403,66 |
| | | | | | | | | 2,249 | | | | | 17,52 | 59,96 | 7,02 | | | | 1161,25 | 3,12 | 372,38 |
| 5.5A | 68,97 | 5,82 | 5,5 | 1163,55 | 1174,24 | 660,13 | 514,11 | 2,263 | 2,403 | 11,623 | 82,5554 | 5,822 | 17,44 | 66,63 | 5,82 | 67 | 1332,31 | 0,88 | 1169,10 | 2,85 | 410,21 |
| 5.5B | 68,70 | 5,82 | 5,5 | 1170,98 | 1181,04 | 663,22 | 517,82 | 2,261 | 2,403 | 11,613 | 82,4873 | 5,900 | 17,51 | 66,31 | 5,90 | 65 | 1292,54 | 0,88 | 1140,66 | 3,40 | 335,49 |
| 5.5C | 67,37 | 5,82 | 5,5 | 1172,98 | 1179,04 | 661,22 | 517,82 | 2,265 | 2,403 | 11,633 | 82,6282 | 5,739 | 17,37 | 66,96 | 5,74 | 67 | 1332,31 | 0,91 | 1216,84 | 3,30 | 368,74 |
| | | | | | | | | 2,263 | | | | | 17,44 | 66,63 | 5,82 | | | | 1175,54 | 3,18 | 371,48 |
| 6A | 67,43 | 6,38 | 6 | 1186,38 | 1196,57 | 671,57 | 525,00 | 2,260 | 2,387 | 12,660 | 81,9931 | 5,347 | 18,01 | 70,31 | 5,35 | 82 | 1630,59 | 0,91 | 1486,55 | 3,20 | 464,55 |
| 6B | 67,57 | 6,38 | 6 | 1174,06 | 1181,65 | 663,6 | 518,05 | 2,266 | 2,387 | 12,696 | 82,2302 | 5,073 | 17,77 | 71,45 | 5,07 | 77 | 1531,16 | 0,91 | 1390,80 | 3,60 | 386,33 |
| 6C | 68,45 | 6,38 | 6 | 1172,06 | 1184,65 | 664,6 | 520,05 | 2,254 | 2,387 | 12,626 | 81,7744 | 5,600 | 18,23 | 69,28 | 5,60 | 78 | 1551,05 | 0,89 | 1376,07 | 3,70 | 371,91 |
| | | | | | | | | 2,260 | | | | | 18,00 | 70,34 | 5,34 | | | | 1417,81 | 3,50 | 407,60 |
| 6.5A | 64,30 | 6,95 | 6,5 | 1177,71 | 1182,9 | 665,31 | 517,59 | 2,275 | 2,372 | 13,809 | 82,12 | 4,071 | 17,88 | 77,23 | 4,07 | 77 | 1531,16 | 0,98 | 1500,54 | 3,60 | 416,82 |
| 6.5B | 66,10 | 6,95 | 6,5 | 1175,29 | 1184,39 | 664,79 | 519,60 | 2,262 | 2,372 | 13,728 | 81,6342 | 4,638 | 18,37 | 74,75 | 4,64 | 76 | 1511,28 | 0,94 | 1422,49 | 3,65 | 389,72 |
| 6.5C | 67,65 | 6,95 | 6,5 | 1173,29 | 1183,39 | 667,79 | 515,60 | 2,276 | 2,372 | 13,811 | 82,1275 | 4,062 | 17,87 | 77,27 | 4,06 | 73 | 1451,62 | 0,91 | 1315,65 | 3,45 | 381,35 |
| | | | | | | | | 2,271 | | | | | 18,04 | 76,42 | 4,26 | | | | 1412,89 | 3,57 | 395,96 |
| 7A | 67,67 | 7,53 | 7 | 1175,14 | 1184,35 | 664,19 | 520,16 | 2,259 | 2,357 | 14,766 | 81,0999 | 4,134 | 18,90 | 78,13 | 4,13 | 72 | 1431,73 | 0,91 | 1296,91 | 3,85 | 336,86 |
| 7B | 67,08 | 7,53 | 7 | 1172,53 | 1181,99 | 666,79 | 515,20 | 2,276 | 2,357 | 14,875 | 81,6988 | 3,426 | 18,30 | 81,28 | 3,43 | 72 | 1431,73 | 0,92 | 1318,03 | 3,65 | 361,10 |
| 7C | 68,49 | 7,53 | 7 | 1174,53 | 1180,99 | 664,79 | 516,20 | 2,275 | 2,357 | 14,871 | 81,6796 | 3,449 | 18,32 | 81,17 | 3,45 | 80 | 1590,82 | 0,89 | 1410,06 | 3,65 | 386,32 |
| | | | | | | | | 2,270 | | | | | 18,51 | 80,19 | 3,67 | | | | 1341,67 | 3,72 | 361,43 |

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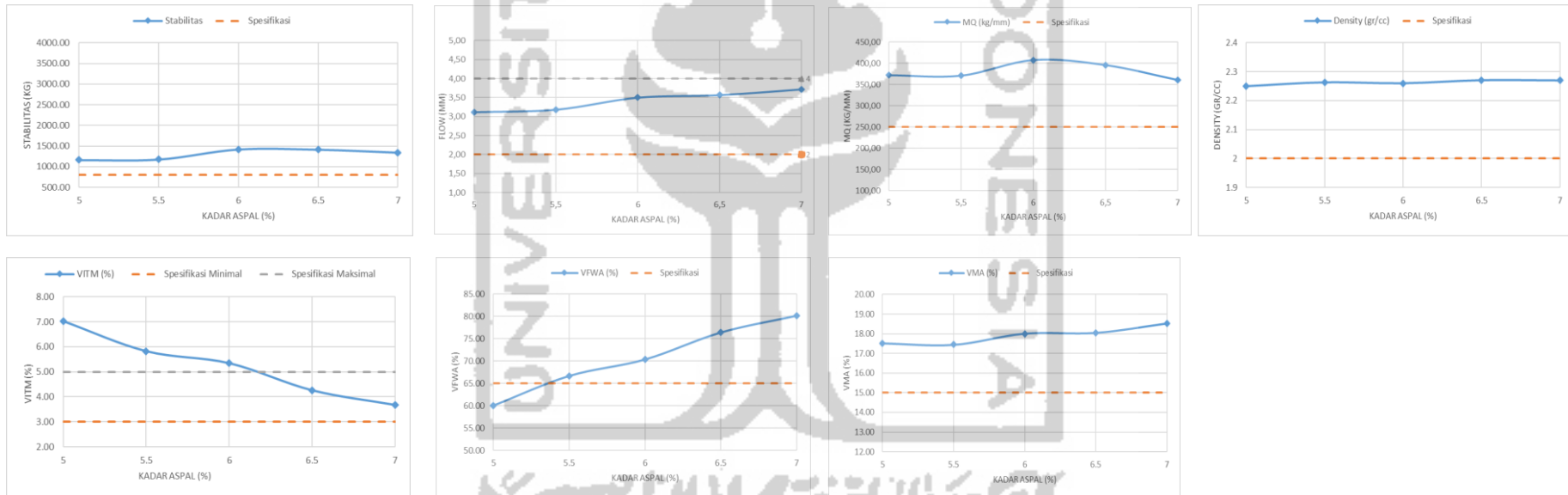
Ir. Subarkah, M.T

Peneliti

Bagas Novika Ardi
15511252

Lampiran 23 Grafik Pengujian *Marshall* dalam Mencari KAO Kadar *Filler* Pengganti Serbuk Batu Gamping 100%

GRAFIK PENGUJIAN MARSHALL DALAM MENCARI KAO KADAR *FILLER* PENGGANTI SERBUK BATU GAMPING 100%





Lampiran 24 Hasil Pengaruh *Filler* Pengganti Gamping terhadap Pengujian *Marshall* 0,5 Jam dengan KAO

PENGUJIAN MARSHALL DARI HASIL KAO

Tanggal Pengujian :
Tipe Campuran : *Asphalt Concrete – Wearing Course (AC-WC) Gradasi Superpave*

Dikerjakan Oleh : Bagas Novika Ardi
Diperiksa Oleh : Berlian Kushari, ST., M.Eng.

| Sampel | Tinggi | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|--------|--------|------|-------|---------|---------|--------|--------|--------------|-------|--------|---------|-------|--------------|--------------|-------------|------|---------|---------|-----------------|-------------|---------------|
| | (cm) | (%) | (%) | (gram) | (gram) | (gram) | (gram) | Density | | | | | VMA (%) | VFWA (%) | VITM (%) | Meas | | Koreksi | Stabilitas (kg) | Flow (mm) | MQ (Kg/mm) |
| 0-A | 64,63 | 6,89 | 6,45 | 1161,61 | 1171,82 | 659,5 | 512,32 | 2,267 | 2,386 | 13,655 | 81,382 | 4,963 | 18,62 | 73,34 | 4,96 | 93 | 1849,32 | 0,97 | 1796,93 | 2,90 | 619,63 |
| 0-B | 65,67 | 6,89 | 6,45 | 1179,18 | 1189,78 | 670 | 519,78 | 2,269 | 2,386 | 13,663 | 81,4273 | 4,910 | 18,57 | 73,56 | 4,91 | 82 | 1630,59 | 0,96 | 1558,57 | 3,50 | 445,31 |
| 0-C | 65,43 | 6,89 | 6,45 | 1175,25 | 1181,09 | 664,42 | 516,67 | 2,275 | 2,386 | 13,699 | 81,6444 | 4,657 | 18,36 | 74,63 | 4,66 | 72 | 1431,73 | 0,96 | 1376,85 | 2,70 | 509,94 |
| | | | | | | | | 2,270 | | | | | 18,52 | 73,85 | 4,84 | | | | 1577,45 | 3,03 | 524,96 |
| 25-A | 64,70 | 6,95 | 6,5 | 1167,82 | 1178,95 | 664,28 | 514,67 | 2,269 | 2,381 | 13,771 | 81,5287 | 4,700 | 18,47 | 74,55 | 4,70 | 97 | 1928,86 | 0,97 | 1871,00 | 3,00 | 623,67 |
| 25-B | 63,93 | 6,95 | 6,5 | 1171,11 | 1178,6 | 661,64 | 516,96 | 2,265 | 2,381 | 13,749 | 81,3962 | 4,855 | 18,60 | 73,90 | 4,86 | 93 | 1849,32 | 0,99 | 1829,29 | 3,10 | 590,09 |
| 25-C | 64,87 | 6,95 | 6,5 | 1172,75 | 1179,56 | 663,27 | 516,29 | 2,271 | 2,381 | 13,786 | 81,6159 | 4,598 | 18,38 | 74,99 | 4,60 | 72 | 1431,73 | 0,97 | 1382,82 | 2,90 | 476,83 |
| | | | | | | | | 2,269 | | | | | 18,49 | 74,48 | 4,72 | | | | 1694,37 | 3,00 | 563,53 |
| 50-A | 65,77 | 7,01 | 6,55 | 1173,67 | 1174,39 | 659,13 | 515,26 | 2,278 | 2,376 | 13,931 | 81,9289 | 4,140 | 18,07 | 77,09 | 4,14 | 101 | 2008,41 | 0,95 | 1914,68 | 3,20 | 598,34 |
| 50-B | 65,53 | 7,01 | 6,55 | 1167,70 | 1175,05 | 659,05 | 516,00 | 2,263 | 2,376 | 13,840 | 81,3953 | 4,765 | 18,60 | 74,39 | 4,76 | 100 | 1988,52 | 0,96 | 1907,32 | 3,20 | 596,04 |
| 50-C | 67,10 | 7,01 | 6,55 | 1173,68 | 1180,17 | 663,63 | 516,54 | 2,272 | 2,376 | 13,896 | 81,7266 | 4,377 | 18,27 | 76,05 | 4,38 | 92 | 1829,44 | 0,92 | 1683,08 | 3,30 | 510,03 |
| | | | | | | | | 2,271 | | | | | 18,32 | 75,84 | 4,43 | | | | 1835,03 | 3,23 | 568,13 |
| 75-A | 65,17 | 7,04 | 6,575 | 1175,88 | 1165,79 | 652,87 | 512,92 | 2,293 | 2,372 | 14,074 | 82,5663 | 3,360 | 17,43 | 80,73 | 3,36 | 83 | 1650,47 | 0,96 | 1582,39 | 3,50 | 452,11 |
| 75-B | 67,07 | 7,04 | 6,575 | 1179,05 | 1180,54 | 657,4 | 523,14 | 2,254 | 2,372 | 13,836 | 81,1716 | 4,992 | 18,83 | 73,49 | 4,99 | 87 | 1730,01 | 0,92 | 1593,05 | 3,60 | 442,51 |
| 75-C | 67,50 | 7,04 | 6,575 | 1173,94 | 1175,3 | 658,88 | 516,42 | 2,273 | 2,372 | 13,956 | 81,8714 | 4,173 | 18,13 | 76,98 | 4,17 | 94 | 1869,21 | 0,91 | 1700,98 | 3,60 | 472,49 |
| | | | | | | | | 2,273 | | | | | 18,13 | 77,07 | 4,17 | | | | 1625,47 | 3,57 | 455,71 |
| 100-A | 67,03 | 7,08 | 6,61 | 1174,05 | 1179,59 | 664,51 | 515,08 | 2,279 | 2,368 | 14,068 | 82,1917 | 3,741 | 17,81 | 79,00 | 3,74 | 86 | 1710,13 | 0,92 | 1576,17 | 3,70 | 425,99 |
| 100-B | 68,00 | 7,08 | 6,61 | 1180,95 | 1182,82 | 661,5 | 521,32 | 2,265 | 2,368 | 13,981 | 81,6851 | 4,334 | 18,31 | 76,34 | 4,33 | 94 | 1869,21 | 0,95 | 1768,74 | 3,60 | 491,32 |
| 100-C | 66,90 | 7,08 | 6,61 | 1181,96 | 1183,47 | 664,79 | 518,68 | 2,279 | 2,368 | 14,064 | 82,1711 | 3,765 | 17,83 | 78,88 | 3,76 | 87 | 1730,01 | 0,93 | 1613,24 | 3,80 | 424,54 |
| | | | | | | | | 2,274 | | | | | 17,98 | 78,07 | 3,95 | | | | 1652,71 | 3,70 | 447,28 |

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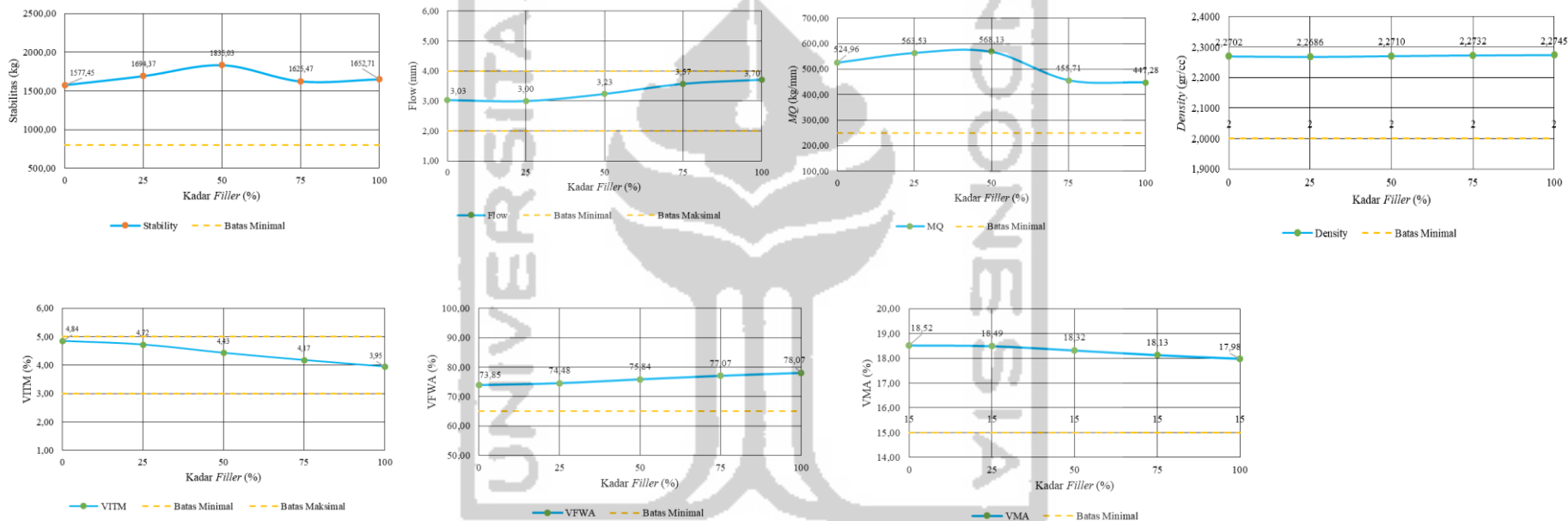
Ir. Subarkah, M.T

Peneliti

Bagas Novika Ardi
15511252

Lampiran 25 Grafik Pengaruh *Filler* Pengganti Gamping terhadap Pengujian *Marshall* 0,5 Jam dengan KAO

GRAFIK PENGUJIAN MARSHALL DENGAN KAO KADAR *FILLER* PENGGANTI SERBUK BATU GAMPING





Lampiran 26 Hasil Pengaruh *Filler* Pengganti Gamping terhadap Pengujian *Marshall* 24 Jam dengan KAO

PENGUJIAN MARSHALL DARI HASIL KAO

Tanggal Pengujian :
Tipe Campuran : *Asphalt Concrete – Wearing Course (AC-WC) Gradasi Superpave*

Dikerjakan Oleh : Bagas Novika Ardi
Diperiksa Oleh : Berlian Kushari, ST., M.Eng.

| Sampel | Tinggi | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|--------|--------|------|-------|---------|---------|--------|--------|--------------|-------|--------|---------|-------|--------------|--------------|-------------|----|---------|------|----------------|-------------|---------------|
| | (cm) | (%) | (%) | (gram) | (gram) | (gram) | (gram) | Density | | | | | | | | | | | | | |
| 0-1 | 63,53 | 6,89 | 6,45 | 1180,04 | 1184,24 | 659,79 | 524,45 | 2,250 | 2,382 | 13,678 | 80,7722 | 5,549 | 19,23 | 71,14 | 5,55 | 76 | 1511,28 | 1,00 | 1510,27 | 2,20 | 686,49 |
| 0-2 | 64,36 | 6,89 | 6,45 | 1186,44 | 1187,96 | 667,38 | 520,58 | 2,279 | 2,382 | 13,855 | 81,814 | 4,331 | 18,19 | 76,18 | 4,33 | 73 | 1451,62 | 0,98 | 1420,53 | 3,00 | 473,51 |
| 0-3 | 64,00 | 6,89 | 6,45 | 1180,83 | 1183,06 | 665 | 518,06 | 2,279 | 2,382 | 13,856 | 81,8232 | 4,320 | 18,18 | 76,23 | 4,32 | 72 | 1431,73 | 0,99 | 1413,84 | 2,25 | 628,37 |
| | | | | | | | | 2,269 | | | | | 18,53 | 74,52 | 4,73 | | | | 1448,21 | 2,48 | 596,12 |
| 25-1 | 63,62 | 6,95 | 6,5 | 1185,57 | 1188,75 | 669,24 | 519,51 | 2,282 | 2,378 | 13,981 | 82,0045 | 4,015 | 18,00 | 77,69 | 4,01 | 82 | 1630,59 | 1,00 | 1625,56 | 2,60 | 625,21 |
| 25-2 | 63,88 | 6,95 | 6,5 | 1183,2 | 1185,54 | 663,15 | 522,39 | 2,265 | 2,378 | 13,876 | 81,3894 | 4,735 | 18,61 | 74,56 | 4,73 | 81 | 1610,70 | 0,99 | 1595,40 | 2,70 | 590,89 |
| 25-3 | 64,93 | 6,95 | 6,5 | 1183,56 | 1186,4 | 666,12 | 520,28 | 2,275 | 2,378 | 13,936 | 81,7443 | 4,319 | 18,26 | 76,34 | 4,32 | 79 | 1570,93 | 0,96 | 1514,64 | 2,50 | 605,86 |
| | | | | | | | | 2,274 | | | | | 18,29 | 76,20 | 4,36 | | | | 1578,53 | 2,60 | 607,32 |
| 50-1 | 67,02 | 7,01 | 6,55 | 1184 | 1187,4 | 663,11 | 524,29 | 2,258 | 2,373 | 13,941 | 81,2307 | 4,828 | 18,77 | 74,28 | 4,83 | 91 | 1809,55 | 0,92 | 1668,26 | 2,80 | 595,81 |
| 50-2 | 66,46 | 7,01 | 6,55 | 1180,3 | 1184,11 | 665,53 | 518,58 | 2,276 | 2,373 | 14,051 | 81,8685 | 4,081 | 18,13 | 77,49 | 4,08 | 95 | 1889,09 | 0,93 | 1765,36 | 2,60 | 678,98 |
| 50-3 | 64,88 | 7,01 | 6,55 | 1185,69 | 1187,9 | 668,02 | 519,88 | 2,281 | 2,373 | 14,080 | 82,0367 | 3,884 | 17,96 | 78,38 | 3,88 | 90 | 1789,67 | 0,97 | 1727,92 | 3,00 | 575,97 |
| | | | | | | | | 2,272 | | | | | 18,29 | 76,72 | 4,26 | | | | 1720,51 | 2,80 | 616,92 |
| 75-1 | 64,95 | 7,04 | 6,575 | 1174,92 | 1178,35 | 665,86 | 512,49 | 2,293 | 2,369 | 14,207 | 82,5688 | 3,224 | 17,43 | 81,50 | 3,22 | 83 | 1650,47 | 0,96 | 1590,64 | 2,40 | 662,77 |
| 75-2 | 67,42 | 7,04 | 6,575 | 1178,12 | 1181,63 | 664,22 | 517,41 | 2,277 | 2,369 | 14,110 | 82,0064 | 3,883 | 17,99 | 78,42 | 3,88 | 79 | 1570,93 | 0,91 | 1432,56 | 3,20 | 447,67 |
| 75-3 | 64,90 | 7,04 | 6,575 | 1179,97 | 1182,42 | 670,22 | 512,2 | 2,304 | 2,369 | 14,276 | 82,9707 | 2,753 | 17,03 | 83,83 | 2,75 | 80 | 1590,82 | 0,96 | 1535,00 | 3,10 | 495,16 |
| | | | | | | | | 2,291 | | | | | 17,48 | 81,25 | 3,29 | | | | 1519,40 | 2,90 | 535,20 |
| 100-1 | 68,93 | 7,08 | 6,61 | 1179,54 | 1185,92 | 666,46 | 519,46 | 2,271 | 2,365 | 14,146 | 81,8769 | 3,977 | 18,12 | 78,06 | 3,98 | 82 | 1630,59 | 0,88 | 1431,86 | 3,25 | 440,57 |
| 100-2 | 65,11 | 7,08 | 6,61 | 1177,76 | 1181,44 | 668,85 | 512,59 | 2,298 | 2,365 | 14,314 | 82,849 | 2,837 | 17,15 | 83,46 | 2,84 | 80 | 1590,82 | 0,96 | 1526,79 | 2,90 | 526,48 |
| 100-3 | 65,61 | 7,08 | 6,61 | 1179,43 | 1182,93 | 666,48 | 516,45 | 2,284 | 2,365 | 14,228 | 82,3464 | 3,426 | 17,65 | 80,59 | 3,43 | 80 | 1590,82 | 0,95 | 1511,97 | 2,30 | 657,38 |
| | | | | | | | | 2,284 | | | | | 17,64 | 80,70 | 3,41 | | | | 1490,21 | 2,82 | 541,48 |

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Bagas Novika Ardi
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Lampiran 27 Pengujian *Indirect Tensile Strength* dari Hasil KAO

PENGUJIAN *INDIRECT TENSILE STRENGTH* DARI HASIL KAO

Tanggal Pengujian :
Tipe Campuran : *Asphalt Concrete – Wearing Course (AC-WC) Gradasi Superpave*

Dikerjakan Oleh : Bagas Novika Ardi
Diperiksa Oleh : Berlian Kushari, ST., M.Eng.

| Kadar Gamping (%) | KAO (%) | Sampel | Diameter (cm) | Tebal (mm) | | | Tebal Rata-rata | | | Arloji Stab. | Stabilitas | | AO | ITS (kg/cm ²) |
|-------------------|---------|--------|---------------|------------|-------|-------|-----------------|-------|---------------|--------------|-------------------|-----------------|-------|---------------------------|
| | | | | t1 | t2 | t3 | mm | cm | Angka koreksi | | Stab. * Kalibrasi | Stabilitas (kg) | | |
| 0 | 6.45 | 1 | 10 | 63.42 | 63.47 | 63.6 | 63.497 | 6.350 | 0.960 | 70 | 1391.964 | 1336.401 | 0.159 | 33.363 |
| | | 2 | 10 | 62.71 | 62.75 | 63.06 | 62.840 | 6.284 | 0.977 | 54 | 1073.801 | 1048.566 | 0.159 | 26.451 |
| | | 3 | 10 | 63.65 | 63.67 | 63.99 | 63.770 | 6.377 | 0.993 | 57 | 1133.456 | 1125.806 | 0.159 | 27.985 |
| | | | | | | | | | | | 1170.258 | | | 29.267 |
| 25 | 6.5 | 1 | 10 | 64.36 | 64.57 | 64.54 | 64.490 | 6.449 | 0.975 | 61 | 1212.997 | 1182.976 | 0.159 | 29.078 |
| | | 2 | 10 | 63.34 | 64.57 | 63.55 | 63.820 | 6.382 | 0.992 | 60 | 1193.112 | 1183.567 | 0.159 | 29.398 |
| | | 3 | 10 | 63.96 | 63.48 | 63.98 | 63.807 | 6.381 | 0.992 | 63 | 1252.768 | 1243.163 | 0.159 | 30.885 |
| | | | | | | | | | | | 1203.235 | | | 29.787 |
| 50 | 6.55 | 1 | 10 | 69.92 | 70.78 | 70.58 | 70.427 | 7.043 | 0.849 | 65 | 1292.538 | 1097.968 | 0.159 | 24.714 |
| | | 2 | 10 | 65.18 | 65.05 | 65.15 | 65.127 | 6.513 | 0.960 | 69 | 1372.079 | 1316.510 | 0.159 | 32.044 |
| | | 3 | 10 | 65.08 | 64.6 | 64.49 | 64.723 | 6.472 | 0.969 | 64 | 1272.653 | 1233.731 | 0.159 | 30.216 |
| | | | | | | | | | | | 1216.069 | | | 28.991 |
| 75 | 6.575 | 1 | 10 | 65.57 | 65.34 | 65.42 | 65.443 | 6.544 | 0.954 | 63 | 1252.768 | 1194.592 | 0.159 | 28.936 |
| | | 2 | 10 | 64.88 | 65.01 | 64.98 | 64.957 | 6.496 | 0.964 | 61 | 1212.997 | 1168.824 | 0.159 | 28.524 |
| | | 3 | 10 | 65.87 | 65.91 | 65.56 | 65.780 | 6.578 | 0.947 | 60 | 1193.112 | 1130.175 | 0.159 | 27.235 |
| | | | | | | | | | | | 1164.530 | | | 28.232 |
| 100 | 6.61 | 1 | 10 | 65.54 | 64.44 | 65.05 | 65.010 | 6.501 | 0.962 | 62 | 1232.882 | 1185.648 | 0.159 | 28.911 |
| | | 2 | 10 | 68.46 | 67.35 | 68.23 | 68.013 | 6.801 | 0.887 | 52 | 1034.030 | 917.357 | 0.159 | 21.381 |
| | | 3 | 10 | 65.46 | 65.58 | 65.68 | 65.573 | 6.557 | 0.951 | 58 | 1153.342 | 1096.972 | 0.159 | 26.519 |
| | | | | | | | | | | | 1066.659 | | | 25.603 |

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Ir. Subarkah, M.T

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Bagas Novika Ardi
15511252


Lampiran 28 Pengujian *Cantabro* dari Hasil KAO


PENGUJIAN CANTABRO DARI HASIL KAO

Tanggal Pengujian :
Tipe Campuran : *Asphalt Concrete – Wearing Course (AC-WC) Gradasi Superpave*

Dikerjakan Oleh : Bagas Novika Ardi
Diperiksa Oleh : Berlian Kushari, ST., M.Eng.

| Kadar Gamping (%) | Sampel | Berat Benda Uji (gram) | | Berat Sebelum Di Abrasi (gram) | Kehilangan Berat (%) | Rata-rata Kehilangan Berat (%) |
|-------------------|--------|------------------------|---------|--------------------------------|----------------------|--------------------------------|
| | | Mo | Mi | (Mo-Mi) | L | |
| 0 | 1 | 1179.59 | 1146.03 | 33.56 | 2.8451 | 2.0451 |
| | 2 | 1181.11 | 1162.89 | 18.22 | 1.5426 | |
| | 3 | 1184.51 | 1163.81 | 20.7 | 1.7476 | |
| 25 | 1 | 1180.68 | 1156.2 | 24.48 | 2.0734 | 2.2843 |
| | 2 | 1177.75 | 1152.55 | 25.2 | 2.1397 | |
| | 3 | 1180.32 | 1149.16 | 31.16 | 2.6400 | |
| 50 | 1 | 1177.36 | 1143.72 | 33.64 | 2.8572 | 2.4870 |
| | 2 | 1178.45 | 1143.25 | 35.2 | 2.9870 | |
| | 3 | 1177.55 | 1158.51 | 19.04 | 1.6169 | |
| 75 | 1 | 1166.77 | 1083.57 | 83.2 | 7.1308 | 5.8857 |
| | 2 | 1180.36 | 1141.38 | 38.98 | 3.3024 | |
| | 3 | 1175.26 | 1090.36 | 84.9 | 7.2239 | |
| 100 | 1 | 1189.31 | 1149.63 | 39.68 | 3.3364 | 6.6495 |
| | 2 | 1178.87 | 1056.82 | 122.05 | 10.3531 | |
| | 3 | 1176.89 | 1103.23 | 73.66 | 6.2589 | |

Mengetahui,
Ka. Lab. Jalan Raya

Ir. Subarkah, M.T

Peneliti

Bagas Novika Ardi
15511252

Lampiran 29 Tabel Konstanta A0

| Diameter (inchi) | A0 | A1 | A2 | A3 | A4 | A5 | A6 | B1 | B2 | B3 | B4 |
|------------------|-------|-------|---------|--------|---------|---------|---------|---------|---------|---------|---------|
| 3,5 | 0,177 | 0,077 | -0,2847 | 0,268 | -0,9966 | 0,05056 | -0,1545 | -0,9765 | -0,0204 | -0,1545 | 0,05056 |
| 3,6 | 0,172 | 0,075 | -0,2769 | 0,2683 | -0,9968 | 0,04786 | -0,1461 | -0,956 | -0,0193 | -0,1481 | 0,04786 |
| 3,7 | 0,168 | 0,073 | -0,2694 | 0,2685 | -0,997 | 0,04516 | -0,1384 | -0,9422 | -0,0183 | -0,1384 | 0,04537 |
| 3,8 | 0,164 | 0,707 | -0,2624 | 0,2688 | -0,9971 | 0,04246 | -0,1312 | -0,926 | -0,0173 | -0,1312 | 0,04307 |
| 3,9 | 0,16 | -0,69 | -0,2557 | 0,269 | -0,9973 | 0,04049 | -0,1246 | -0,9104 | -0,0165 | -0,1247 | 0,04094 |
| 4 | 0,156 | 0,067 | -0,2494 | 0,2692 | -0,9974 | 0,03852 | -0,1185 | -0,8954 | -0,0156 | -0,1185 | 0,03896 |
| 4,1 | 0,152 | 0,066 | -0,2494 | 0,2694 | -0,9975 | 0,03655 | -0,1129 | -0,881 | -0,0149 | -0,1129 | 0,03712 |
| 4,2 | 0,149 | 0,064 | 0,2433 | 0,2696 | -0,9976 | 0,03458 | -0,1076 | -0,8671 | -0,0142 | -0,1076 | 0,03541 |
| 4,3 | 0,145 | 0,063 | -0,2375 | 0,2698 | -0,9977 | 0,03361 | -0,1027 | -0,8537 | -0,0136 | -0,1027 | 0,03381 |
| 4,4 | 0,142 | 0,613 | -0,2320 | 0,2699 | -0,9978 | 0,03264 | -0,0981 | -0,8409 | -0,0130 | -0,0981 | 0,03232 |
| 4,5 | 0,139 | 0,06 | -0,2268 | 0,2701 | -0,9979 | 0,03067 | -0,0938 | -0,8282 | -0,0124 | -0,0938 | 0,03092 |
| 4,6 | 0,136 | 0,059 | -0,2218 | 0,2702 | -0,998 | 0,02871 | -0,0898 | -0,8161 | -0,0118 | -0,0898 | 0,02961 |
| 4,7 | 0,133 | 0,575 | -0,2170 | 0,2703 | -0,9981 | 0,02812 | -0,086 | -0,8043 | -0,0114 | -0,0860 | 0,02839 |
| 4,8 | 0,131 | 0,056 | -0,2124 | 0,2704 | -0,9982 | 0,02753 | -0,0825 | -0,793 | -0,0109 | -0,0825 | 0,02723 |
| 4,9 | 0,128 | 0,055 | -0,2080 | 0,2706 | -0,9983 | 0,02694 | -0,0792 | -0,782 | -0,0105 | -0,0792 | 0,02615 |
| 5 | 0,126 | 0,054 | -0,2037 | 0,2707 | -0,9983 | 0,02635 | -0,076 | -0,7714 | -0,0100 | -0,0761 | 0,02513 |
| 5,1 | 0,123 | 0,053 | -0,1997 | 0,2708 | -0,9984 | 0,02576 | -0,0731 | -0,761 | -0,0097 | -0,0731 | 0,02416 |
| 5,2 | 0,121 | 0,052 | -0,1958 | 0,2709 | -0,9985 | 0,02517 | -0,0703 | -0,751 | -0,0093 | -0,0703 | 0,02325 |
| 5,3 | 0,119 | 0,051 | -0,1920 | 0,2709 | -0,9985 | 0,02458 | -0,0677 | -0,7413 | -0,0090 | -0,0677 | 0,02240 |
| 5,4 | 0,116 | 0,05 | -0,1884 | 0,271 | -0,9986 | 0,02399 | -0,0652 | -0,7319 | -0,0086 | -0,0652 | 0,02156 |
| 5,5 | 0,114 | 0,049 | -0,1849 | 0,2711 | -0,9986 | 0,0234 | -0,0629 | -0,7227 | -0,0083 | -0,0629 | 0,02061 |
| 5,6 | 0,112 | 0,048 | -0,1816 | 0,2712 | -0,9987 | 0,02281 | -0,0607 | -0,7138 | -0,0080 | -0,0607 | 0,02008 |
| 5,7 | 0,11 | 0,048 | -0,1783 | 0,2713 | -0,9987 | 0,02222 | -0,0586 | -0,7051 | -0,0078 | -0,0586 | 0,01939 |
| 5,8 | 0,109 | 0,047 | -0,1752 | 0,2713 | -0,9988 | 0,02163 | -0,0566 | -0,6967 | -0,0075 | -0,0566 | 0,01874 |
| 5,9 | 0,107 | 0,046 | -0,1722 | 0,2714 | -0,9988 | 0,02104 | -0,0547 | -0,6884 | -0,0072 | -0,0547 | 0,01811 |
| 6 | 0,105 | 0,045 | -0,1693 | 0,2714 | -0,9988 | 0,02045 | -0,0529 | -0,6804 | -0,0070 | -0,0529 | 0,01752 |
| 6,1 | 0,103 | 0,045 | -0,1665 | 0,2715 | -0,9989 | 0,01986 | -0,0512 | -0,6727 | -0,0068 | -0,0512 | 0,01696 |
| 6,2 | 0,102 | 0,044 | -0,1638 | 0,2716 | -0,9989 | 0,01927 | -0,0495 | -0,6651 | -0,0066 | -0,0495 | 0,01642 |
| 6,3 | 0,1 | 0,043 | -0,1586 | 0,2716 | -0,9989 | 0,01868 | -0,048 | -0,6577 | -0,0064 | -0,0480 | 0,01591 |
| 6,4 | 0,099 | 0,042 | -0,1561 | 0,2717 | -0,999 | 0,01809 | -0,0465 | -0,6504 | -0,0062 | -0,0465 | 0,01542 |
| 6,5 | 0,097 | 0,042 | -0,1537 | 0,2717 | -0,999 | 0,0175 | -0,0451 | -0,6434 | -0,0060 | -0,0451 | 0,01495 |

Lampiran 30 Tabel Analisis Hasil Pengujian dengan *Anova* Satu Arah

Test of Homogeneity of Variances

| | Levene Statistic | df1 | df2 | Sig. |
|----------------------------|------------------|-----|-----|------|
| <i>Stabilitas_Marshall</i> | 1.284 | 4 | 10 | .339 |
| <i>Flow</i> | 1.609 | 4 | 10 | .247 |
| <i>MQ</i> | 1.904 | 4 | 10 | .186 |
| <i>VITM</i> | 4.022 | 4 | 10 | .034 |
| <i>VFWA</i> | 4.431 | 4 | 10 | .026 |
| <i>VMA</i> | 4.101 | 4 | 10 | .032 |
| <i>ITS</i> | 13.600 | 4 | 10 | .000 |
| <i>IRS</i> | 2.648 | 4 | 10 | .096 |
| <i>Cantabro</i> | 3.390 | 4 | 10 | .053 |
| <i>Density</i> | 3.881 | 4 | 10 | .037 |

ANOVA

| | | Sum of Squares | df | Mean Square | F | Sig. |
|----------------------------|----------------|----------------|----|-------------|-------|------|
| <i>Stabilitas_Marshall</i> | Between Groups | 162941.087 | 4 | 40735.272 | 4.953 | .018 |
| | Within Groups | 82248.982 | 10 | 8224.898 | | |
| | Total | 245190.069 | 14 | | | |
| | | | | | | |
| <i>Flow</i> | Between Groups | .143 | 4 | .036 | 1.911 | .185 |
| | Within Groups | .187 | 10 | .019 | | |
| | Total | .329 | 14 | | | |
| | | | | | | |
| <i>MQ</i> | Between Groups | 47447.690 | 4 | 11861.922 | 1.875 | .192 |
| | Within Groups | 63278.171 | 10 | 6327.817 | | |
| | Total | 110725.861 | 14 | | | |
| | | | | | | |
| <i>VITM</i> | Between Groups | .460 | 4 | .115 | .432 | .783 |
| | Within Groups | 2.664 | 10 | .266 | | |
| | Total | 3.124 | 14 | | | |
| | | | | | | |
| <i>VFWA</i> | Between Groups | 11.735 | 4 | 2.934 | .580 | .684 |
| | Within Groups | 50.568 | 10 | 5.057 | | |
| | Total | 62.303 | 14 | | | |
| | | | | | | |

Lampiran 31 Lanjutan Tabel Analisis Hasil Pengujian dengan *Anova* Satu Arah

| | | | | | | |
|-----------------|----------------|---------|----|--------|-------------|------|
| <i>VMA</i> | Between Groups | .078 | 4 | .020 | .100 | .980 |
| | Within Groups | 1.944 | 10 | .194 | | |
| | Total | 2.022 | 14 | | | |
| | | | | | | |
| <i>ITS</i> | Between Groups | 25.071 | 4 | 6.268 | 9401708.350 | .000 |
| | Within Groups | .000 | 10 | .000 | | |
| | Total | 25.071 | 14 | | | |
| | | | | | | |
| <i>IRS</i> | Between Groups | 32.607 | 4 | 8.152 | .921 | .489 |
| | Within Groups | 88.506 | 10 | 8.851 | | |
| | Total | 121.113 | 14 | | | |
| | | | | | | |
| <i>Cantabro</i> | Between Groups | 58.637 | 4 | 14.659 | 3.943 | .036 |
| | Within Groups | 37.177 | 10 | 3.718 | | |
| | Total | 95.814 | 14 | | | |
| | | | | | | |
| <i>Density</i> | Between Groups | .000 | 4 | .000 | .072 | .989 |
| | Within Groups | .002 | 10 | .000 | | |
| | Total | .002 | 14 | | | |
| | | | | | | |