

LAMPIRAN

Berikut merupakan tabel penjabaran hasil perhitungan nilai OTTV.

1. Sisi Utara

Tabel. Tipe Kontruksi Dinding Exterior

| Type | Konstruksi | Warna |
|------|------------------|------------------|
| EW 1 | Brick Wall | Putih semi kilap |
| EW 2 | Concrete Precast | Abu-abu/biru tua |

Sumber : Analisa Penulis, 2019

Tabel. Spesifikasi Sistem Fenestrasi Exterior

| No | Kode Tipe Konstruksi Sistem Fenestrasi | Nama | SHGC | U Value (W/m ² K) | Peneduh Luar | Kode Spesifikasi Peneduh Luar | SC total SCxScef |
|----|--|---------------------------------|------|------------------------------|--------------|-------------------------------|------------------|
| 1 | F1 | ASAHIMAS 5 mm CLEAR FLOAT | 0,83 | 5,8 | yes | SE1 | 0,70 |
| 2 | F2 | ASAHIMAS 12 mm PANASAP GREEN | 0,43 | 5,6 | yes | SH1 | 0,50 |
| 3 | F3 | ASAHIMAS 12 mm PANASAP GREEN | 0,43 | 5,6 | yes | SH2 | 0,50 |

Sumber : Analisa Penulis, 2019

Tabel. Elemen Peneduh Luar Horizontal

| No | Kode Peneduh Luar Horizontal | Panjang (P1) | Tinggi (H) | Kemiringan | Scef |
|----|------------------------------|--------------|------------|------------|------|
| | | [m] | [m] | [derajat] | |
| 1 | SH1 | 1,35 | 14,3 | 0 | 1,00 |
| 2 | SH2 | 1,15 | 14,3 | 0 | 1,00 |

Sumber : Analisa Penulis, 2019

Tabel. Elemen Peneduh Luar Eggcrate

| No | Kode Peneduh Luar Vertikal | Panjang (P1) | Tinggi (H) | Panjang (P2) | Lebar (W) | Kemiringan | Scef |
|----|----------------------------|--------------|------------|--------------|-----------|------------|------|
| | | P1 (m) | H (m) | P2 (m) | W (m) | [derajat] | |
| 1 | SE1 | 0,5 | 1,6 | 1,2 | 4,65 | 0 | 0,73 |

Sumber : Analisa Penulis, 2019

Tabel. Identifikasi Fasad

| No | FASAD | Tinggi (jarak antar lantai) | Panjang | Area Fasad | Tipe Konstruksi Dinding | Kode Tipe Konstruksi Sistem Fenestrasi | Area Bukaan | Total Jumlah Lantai | Total Area Fasad |
|----|-------|--------------------------------|---------|-------------------|-------------------------|--|-------------------|---------------------|------------------|
| | | [1] | | [2] | | | [3] | | |
| | | (m) | (m) | (m ²) | | | (m ²) | (m ²) | |
| 1 | U 1 | 15,2 | 5,275 | 80,18 | EW 2 | F1 | 0 | 1 | 80,18 |
| 2 | U 2 | 15,2 | 18,6 | 282,72 | EW 1 | F1 | 102,4 | 1 | 282,72 |
| 3 | U 3 | 15,2 | 10,39 | 157,93 | EW 1 | F1 | 0 | 1 | 157,93 |
| 4 | U 4 | 15,2 | 2,755 | 41,88 | EW 1 | F2 | 39,6 | 1 | 41,88 |
| 5 | U 5 | 15,2 | 7,53 | 114,46 | EW 1 | F3 | 108 | 1 | 114,46 |

Sumber : Analisa Penulis, 2019

Tabel. Konduksi Melalui Dinding

| No | $\alpha ((1-WWR)*U_w*T_{deq})$ | Total Area Fasad (m ²) | Heat Absorption Factor (α) | Total Area Bukaan (m ²) | Window to Wall Ratio (WWR) | 1-WWR | U Value (U _v) wall (W/m ² k) | TDek | OTTV | (A) x OTTV (Watt) | | | | |
|-----|--------------------------------|------------------------------------|-------------------------------------|-------------------------------------|----------------------------|-------|---|-------|-------|-------------------|---------|-------------------|------------|------|
| | | | | | (6) | | | | | | (7) | (9) | (10) | (11) |
| | | | | | = (5)/(1) | | | | | | = 1-(6) | = (4)x(7)x(8)x(9) | = (1)x(10) | |
| U 1 | Concrete Precast | 80,18 | 0,88 | - | - | 1,00 | 5,22 | 10,00 | 45,91 | 3.681,03 | | | | |
| U 2 | Brick Wall | 282,72 | 0,30 | 102,40 | 0,36 | 0,64 | 2,80 | 10,00 | 5,35 | 1.513,34 | | | | |
| U 3 | Brick Wall | 157,93 | 0,30 | - | - | 1,00 | 2,80 | 10,00 | 8,39 | 1.325,41 | | | | |
| U 4 | Brick Wall | 41,88 | 0,30 | 39,60 | 0,95 | 0,05 | 2,80 | 10,00 | 0,46 | 19,10 | | | | |
| U 5 | Brick Wall | 114,46 | 0,30 | 108,00 | 0,94 | 0,06 | 2,80 | 10,00 | 0,47 | 54,18 | | | | |
| | | 677,16 | | 250,00 | 0,37 | | | | | 6.593,06 | | | | |
| | | TOTAL | | TOTAL | TOTAL | | | | | TOTAL | | | | |

Sumber : Analisa Penulis, 2019

Tabel. Konduksi Melalui Bukaannya

| No | (WWR*Uf*ΔT) | Total Area Fasad (m ²) | Total Area Bukaannya (m ²) | Window to Wall Ratio (WWR) | U Value Bukaannya (W/m ² K) | ΔT | OTTV | (A) x OTTV (Watt) | |
|-----|------------------------------|------------------------------------|--|----------------------------|--|------|-------|-------------------|-----------|
| | | (1) | (2) | (3) | | | | (6) | (7) |
| | | Façade | | = (2)/(1) | | | | = (3)x(4)x(5) | = (1)x(6) |
| U 1 | ASAHIMAS 5 mm CLEAR FLOAT | 80,18 | - | - | 5,80 | 5,00 | - | - | |
| U 2 | ASAHIMAS 5 mm CLEAR FLOAT | 282,72 | 102,40 | 0,36 | 5,80 | 5,00 | 10,50 | 2.969,60 | |
| U 3 | ASAHIMAS 5 mm CLEAR FLOAT | 157,93 | - | - | 5,80 | 5,00 | - | - | |
| U 4 | ASAHIMAS 12 mm PANASAP GREEN | 41,88 | 39,60 | 0,95 | 5,60 | 5,00 | 26,48 | 1.108,80 | |
| U 5 | ASAHIMAS 12 mm PANASAP GREEN | 114,46 | 108,00 | 0,94 | 5,60 | 5,00 | 26,42 | 3.024,00 | |
| | | 677,16 | 250,00 | 0,37 | | | | 7.102,40 | |
| | | TOTAL | TOTAL | TOTAL | | | | TOTAL | |

Sumber : Analisa Penulis, 2019

Tabel. Radiasi Melalui Bukaannya

| No | (WWR*SC*SF) | Total Area Fasad (m ²) | Total Area Bukaannya (m ²) | Window to Wall Ratio (WWR) | Solar Factor (SF) | Shading Coefficient (SC=Sck*Sceff) | OTTV | (A) x OTTV (Watt) | |
|-----|------------------------------|------------------------------------|--|----------------------------|-------------------|------------------------------------|-------|-------------------|-----------|
| | | (1) | (2) | (3) | | | | (6) | (7) |
| | | Façade | | = (2)/(1) | | | | = (3)x(4)x(5) | = (1)x(6) |
| U 1 | ASAHIMAS 5 mm CLEAR FLOAT | 80,18 | - | - | 130,00 | 0,70 | - | - | |
| U 2 | ASAHIMAS 5 mm CLEAR FLOAT | 282,72 | 102,40 | 0,36 | 130,00 | 0,70 | 33,10 | 9.358,21 | |
| U 3 | ASAHIMAS 5 mm CLEAR FLOAT | 157,93 | - | - | 130,00 | 0,70 | - | - | |
| U 4 | ASAHIMAS 12 mm PANASAP GREEN | 41,88 | 39,60 | 0,95 | 130,00 | 0,50 | 61,47 | 2.574,00 | |
| U 5 | ASAHIMAS 12 mm PANASAP GREEN | 114,46 | 108,00 | 0,94 | 130,00 | 0,50 | 61,33 | 7.020,00 | |
| | | 677,16 | 250,00 | 0,37 | | | | 18.952,21 | |
| | | TOTAL | TOTAL | TOTAL | | | | TOTAL | |

Sumber : Analisa Penulis, 2019

2. Timur

Tabel. Tipe Kontruksi Dinding Exterior

| Type | Konstruksi | Warna |
|------|------------------|------------------|
| EW 1 | Brick Wall | Putih semi kilap |
| EW 2 | Concrete Precast | Abu-abu/biru tua |

Sumber : Analisa Penulis, 2019

Tabel. Spesifikasi Sistem Fenestrasi Exterior

| No | Kode Tipe Konstruksi Sistem Fenestrasi | Nama | SHGC | U Value (W/m²K) | Peneduh Luar | Kode Spesifikasi Peneduh Luar | SC total SCxScef |
|----|--|------------------------------|------|-----------------|--------------|-------------------------------|------------------|
| 1 | F1 | ASAHIMAS 12 mm PANASAP GREEN | 0,43 | 5,6 | yes | SH1 | 0,47 |
| 2 | F2 | ASAHIMAS 12 mm PANASAP GREEN | 0,43 | 5,6 | yes | SE1 | 0,50 |
| 3 | F3 | ASAHIMAS 12 mm PANASAP GREEN | 0,43 | 5,6 | yes | SE2 | 0,25 |
| 4 | F4 | ASAHIMAS 12 mm PANASAP GREEN | 0,43 | 5,6 | yes | SH2 | 0,36 |

Sumber : Analisa Penulis, 2019

Tabel. Elemen Peneduh Luar Horizontal

| No | Kode Peneduh Luar Horizontal | Panjang (P1) | Tinggi (H) | Kemiringan | Scef |
|----|------------------------------|--------------|------------|------------|------|
| | | [m] | [m] | [derajat] | |
| 1 | SH1 | 1,6 | 14,3 | 0 | 0,94 |
| 2 | SH2 | 3,95 | 7,17 | 0 | 0,72 |

Sumber : Analisa Penulis, 2019

Tabel. Elemen Peneduh Luar Eggcrate

| No | Kode Peneduh Luar Vertikal | Panjang (P1) | Tinggi (H) | Panjang (P2) | Lebar (W) | Kemiringan | Scef |
|----|----------------------------|--------------|------------|--------------|-----------|------------|------|
| | | P1 (m) | H (m) | P2 (m) | W (m) | [derajat] | |
| 1 | SE1 | 0,39 | 7,73 | 1,237 | 3,71 | 0 | 1,00 |
| 2 | SE2 | 7,2 | 6,97 | 7,218 | 3 | 0 | 0,51 |

Sumber : Analisa Penulis, 2019

Tabel. Identifikasi Fasad

| No | FASAD | Tinggi (jarak antar lantai) | Panjang | Area Fasad | Tipe Konstruksi Dinding | Kode Tipe Konstruksi Sistem Fenestrasi | Area Bukaannya | Total Jumlah Lantai | Total Area Fasad |
|----|-------|--------------------------------|---------|-------------------|-------------------------|--|-------------------|---------------------|------------------|
| | | [1] | | [2] | | | [3] | | |
| | | (m) | (m) | (m ²) | | | (m ²) | | |
| 1 | T 1 | 15,2 | 2,19 | 33,29 | EW 2 | F1 | | 1 | 33,29 |
| 2 | T 2 | 15,2 | 23,25 | 353,40 | EW 1 | F1 | | 1 | 353,40 |
| 3 | T 3 | 15,2 | 2,755 | 41,88 | EW 1 | F1 | 39,39 | 1 | 41,88 |
| 4 | T 4 | 7,73 | 3,71 | 28,68 | EW 1 | F2 | 28,67 | 1 | 28,68 |
| 5 | T 5 | 7,73 | 7,8 | 60,29 | EW 1 | F1 | | 1 | 60,29 |
| 6 | T 6 | 11 | 3 | 33,00 | EW 1 | F3 | 20,2 | 1 | 33,00 |
| 7 | T 7 | 11 | 7,03 | 77,33 | EW 1 | F4 | 50,4 | 1 | 77,33 |
| 8 | T 8 | 15,2 | 3 | 45,60 | EW 1 | F1 | | 1 | 45,60 |

Sumber : Analisa Penulis, 2019

Tabel. Konduksi Melalui Dinding

| No | α ((1-WWR)*Uw*Tdeq) | Total Area Fasad (m ²) | Heat Absorption Factor (α) | Total Area Bukaannya (m ²) | Window to Wall Ratio (WWR) | 1-WWR | U Value (Uv) wall (W/m ² k) | TDeq | OTTV | (A) x OTTV (Watt) |
|-----|----------------------------|------------------------------------|-------------------------------------|--|----------------------------|---------|--|-------|-------------------|-------------------|
| | Façade | (1) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| | | | | | = (5)/(1) | = 1-(6) | | | = (4)x(7)x(8)x(9) | = (1)x(10) |
| T 1 | Concrete Precast | 33,29 | 0,88 | - | - | 1,00 | 5,22 | 10,00 | 45,91 | 1.528,24 |
| T 2 | Brick Wall | 353,40 | 0,30 | - | - | 1,00 | 2,80 | 10,00 | 8,39 | 2.965,91 |
| T 3 | Brick Wall | 41,88 | 0,30 | 39,39 | 0,94 | 0,06 | 2,80 | 10,00 | 0,50 | 20,86 |
| T 4 | Brick Wall | 28,68 | 0,30 | 28,67 | 1,00 | 0,00 | 2,80 | 10,00 | 0,00 | 0,07 |
| T 5 | Brick Wall | 60,29 | 0,30 | - | - | 1,00 | 2,80 | 10,00 | 8,39 | 506,02 |
| T 6 | Brick Wall | 33,00 | 0,30 | 20,20 | 0,61 | 0,39 | 2,80 | 10,00 | 3,26 | 107,42 |
| T 7 | Brick Wall | 77,33 | 0,30 | 50,40 | 0,65 | 0,35 | 2,80 | 10,00 | 2,92 | 226,01 |
| | | 673,47 | | 138,66 | 0,21 | | | | | 5.737,23 |

| | | | | | | | | | | |
|--|--|-------|--|-------|-------|--|--|--|--|-------|
| | | TOTAL | | TOTAL | TOTAL | | | | | TOTAL |
|--|--|-------|--|-------|-------|--|--|--|--|-------|

Sumber : Analisa Penulis, 2019

Tabel. Konduksi Melalui Bukaannya

| No | (WWR*Uf*ΔT) | Total Area Fasad (m ²) | Total Area Bukaannya (m ²) | Window to Wall Ratio (WWR) | U Value Bukaannya (W/m ² K) | ΔT | OTTV | (A) x OTTV (Watt) |
|-----|------------------------------|------------------------------------|--|----------------------------|--|------|---------------|-------------------|
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | Façade | | = (2)/(1) | | | = (3)x(4)x(5) | = (1)x(6) |
| T 1 | ASAHIMAS 12 mm PANASAP GREEN | 33,29 | - | - | 5,60 | 5,00 | - | - |
| T 2 | ASAHIMAS 12 mm PANASAP GREEN | 353,40 | - | - | 5,60 | 5,00 | - | - |
| T 3 | ASAHIMAS 12 mm PANASAP GREEN | 41,88 | 39,39 | 0,94 | 5,60 | 5,00 | 26,34 | 1.102,92 |
| T 4 | ASAHIMAS 12 mm PANASAP GREEN | 28,68 | 28,67 | 1,00 | 5,60 | 5,00 | 27,99 | 802,76 |
| T 5 | ASAHIMAS 12 mm PANASAP GREEN | 60,29 | - | - | 5,60 | 5,00 | - | - |
| T 6 | ASAHIMAS 12 mm PANASAP GREEN | 33,00 | 20,20 | 0,61 | 5,60 | 5,00 | 17,14 | 565,60 |
| T 7 | ASAHIMAS 12 mm PANASAP GREEN | 77,33 | 50,40 | 0,65 | 5,60 | 5,00 | 18,25 | 1.411,20 |
| T 8 | ASAHIMAS 12 mm PANASAP GREEN | 45,60 | - | - | 5,60 | 5,00 | - | - |
| | | 673,47 | 138,66 | 0,21 | | | | 3.882,48 |
| | | TOTAL | TOTAL | TOTAL | | | | TOTAL |

Sumber : Analisa Penulis, 2019

Tabel. Radiasi Melalui Bukaannya

| No | (WWR*SC*SF) | Total Area Fasad (m ²) | Total Area Bukaannya (m ²) | Window to Wall Ratio (WWR) | Solar Factor (SF) | Shading Coefficient (SC=Sck*Sceff) | OTTV | (A) x OTTV (Watt) |
|-----|------------------------------|------------------------------------|--|----------------------------|-------------------|------------------------------------|---------------|-------------------|
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | Façade | | = (2)/(1) | | | = (3)x(4)x(5) | = (1)x(6) |
| T 1 | ASAHIMAS 12 mm PANASAP GREEN | 33,29 | - | - | 112,00 | 0,47 | - | - |
| T 2 | ASAHIMAS 12 mm PANASAP GREEN | 353,40 | - | - | 112,00 | 0,47 | - | - |

| | | | | | | | | |
|-----|---------------------------------|---------------|---------------|--------------|--------|------|-------|-----------------|
| T 3 | ASAHIMAS 12 mm PANASAP GREEN | 41,88 | 39,39 | 0,94 | 112,00 | 0,47 | 49,32 | 2.065,33 |
| T 4 | ASAHIMAS 12 mm PANASAP GREEN | 28,68 | 28,67 | 1,00 | 112,00 | 0,50 | 55,98 | 1.605,52 |
| T 5 | ASAHIMAS 12 mm PANASAP GREEN | 60,29 | - | - | 112,00 | 0,47 | - | - |
| T 6 | ASAHIMAS 12 mm PANASAP GREEN | 33,00 | 20,20 | 0,61 | 112,00 | 0,25 | 17,41 | 574,65 |
| T 7 | ASAHIMAS 12 mm PANASAP GREEN | 77,33 | 50,40 | 0,65 | 112,00 | 0,36 | 26,45 | 2.045,68 |
| T 8 | ASAHIMAS 12 mm PANASAP GREEN | 45,60 | - | - | 112,00 | 0,47 | - | - |
| | | 673,47 | 138,66 | 0,21 | | | | 6.291,17 |
| | | TOTAL | TOTAL | TOTAL | | | | TOTAL |

Sumber : Analisa Penulis, 2019

3. Selatan

Tabel. Tipe Kontruksi Dinding Exterior

| Type | Konstruksi | Warna |
|------|------------------|------------------|
| EW 1 | Brick Wall | Putih semi kilap |
| EW 2 | Concrete Precast | Abu-abu/biru tua |

Sumber : Analisa Penulis, 2019

Tabel. Spesifikasi Sistem Fenestrasi Exterior

| No | Kode Tipe Konstruksi Sistem Fenestrasi | Nama | SHGC | U Value (W/m ² K) | Peneduh Luar | Kode Spesifikasi Peneduh Luar | SC total SCxScef |
|----|---|---------------------------------|------|---------------------------------|-----------------|--|---------------------|
| 1 | F1 | ASAHIMAS 5 mm CLEAR FLOAT | 0,83 | 5,8 | yes | SE1 | 0,70 |
| 2 | F2 | ASAHIMAS 12 mm PANASAP GREEN | 0,43 | 5,6 | yes | SH1 | 0,50 |
| 3 | F3 | ASAHIMAS 12 mm PANASAP GREEN | 0,43 | 5,6 | yes | SH2 | 0,50 |

Sumber : Analisa Penulis, 2019

Tabel. Elemen Peneduh Luar Horizontal

| No | Kode Peneduh Luar Horizontal | Panjang (P1) | Tinggi (H) | Kemiringan | Scef |
|----|------------------------------|--------------|------------|------------|------|
| | | [m] | [m] | [derajat] | |
| 1 | SH1 | 1,35 | 14,3 | 0 | 1,00 |
| 2 | SH2 | 1,15 | 14,3 | 0 | 1,00 |

Sumber : Analisa Penulis, 2019

Tabel. Elemen Peneduh Luar Eggcrate

| No | Kode Peneduh Luar Vertikal | Panjang (P1) | Tinggi (H) | Panjang (P2) | Lebar (W) | Kemiringan | Scef |
|----|----------------------------|--------------|------------|--------------|-----------|------------|------|
| | | P1 (m) | H (m) | P2 (m) | W (m) | [derajat] | |
| 1 | SE1 | 0,5 | 1,6 | 1,2 | 4,65 | 0 | 0,73 |

Sumber : Analisa Penulis, 2019

Tabel. Identifikasi Fasad

| No | FASAD | Tinggi (jarak antar lantai) | Panjang | Area Fasad | Tipe Konstruksi Dinding | Kode Tipe Konstruksi Sistem Fenestrasi | Area Bukaannya | Total Jumlah Lantai | Total Area Fasad |
|----|-------|-----------------------------|---------|------------|-------------------------|--|-------------------|---------------------|-------------------|
| | | [1] | | [2] | | | [3] | | = [1]x[3] |
| | | (m) | | (m) | | | (m ²) | | (m ²) |
| 1 | S 1 | 15,2 | 5,275 | 80,18 | EW 2 | F1 | 0 | 1 | 80,18 |
| 2 | S 2 | 15,2 | 18,6 | 282,72 | EW 1 | F1 | 102,4 | 1 | 282,72 |
| 3 | S 3 | 15,2 | 10,39 | 157,93 | EW 1 | F1 | 0 | 1 | 157,93 |
| 4 | S 4 | 15,2 | 2,755 | 41,88 | EW 1 | F2 | 39,6 | 1 | 41,88 |
| 5 | S 5 | 15,2 | 7,53 | 114,46 | EW 1 | F3 | 108 | 1 | 114,46 |

Sumber : Analisa Penulis, 2019

Tabel. Konduksi Melalui Dinding

| No | $\alpha ((1-WWR)*U_w * T_{deq})$ | Total Area Fasad (m ²) | Heat Absorption Factor (α) | Total Area Bukaa n (m ²) | Window to Wall Ratio (WWR) | 1-WWR | U | TDek | OTTV | (A) x OTTV (Watt) |
|-----|----------------------------------|------------------------------------|-------------------------------------|--------------------------------------|----------------------------|----------|--------------------------------------|-------|--------------------|-------------------|
| | | | | | | | Value (Uv) wall (W/m ² k) | | | |
| | | | | | | | (8) | | | |
| | Façade | (1) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| | | | | | = (5)/(1) | = 1- (6) | | | = (4)x(7)x (8)x(9) | = (1)x(10) |
| S 1 | Concrete Precast | 80,18 | 0,88 | - | - | 1,00 | 5,22 | 10,00 | 45,91 | 3.681,03 |
| S 2 | Brick Wall | 282,72 | 0,30 | 102,40 | 0,36 | 0,64 | 2,80 | 10,00 | 5,35 | 1.513,34 |

| | | | | | | | | | | |
|-----|------------|---------------|------|---------------|--------------|------|------|-------|------|-----------------|
| S 3 | Brick Wall | 157,93 | 0,30 | - | - | 1,00 | 2,80 | 10,00 | 8,39 | 1.325,41 |
| S 4 | Brick Wall | 41,88 | 0,30 | 39,60 | 0,95 | 0,05 | 2,80 | 10,00 | 0,46 | 19,10 |
| S 5 | Brick Wall | 114,46 | 0,30 | 108,00 | 0,94 | 0,06 | 2,80 | 10,00 | 0,47 | 54,18 |
| | | 677,16 | | 250,00 | 0,37 | | | | | 6.593,06 |
| | | TOTAL | | TOTAL | TOTAL | | | | | TOTAL |

Sumber : Analisa Penulis, 2019

Tabel. Konduksi Melalui Bukaannya

| No | (WWR*Uf*ΔT) | Total Area Fasad (m ²) | Total Area Bukaannya (m ²) | Window to Wall Ratio (WWR) | U Value Bukaannya (W/m ² K) | ΔT | OTTV | (A) x OTTV (Watt) |
|--------|------------------------------|------------------------------------|--|----------------------------|--|------|---------------|-------------------|
| | | (1) | (2) | (3) | | | | (7) |
| Façade | | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | | | = (2)/(1) | | | = (3)x(4)x(5) | = (1)x(6) |
| S 1 | ASAHIMAS 5 mm CLEAR FLOAT | 80,18 | - | - | 5,80 | 5,00 | - | - |
| S 2 | ASAHIMAS 5 mm CLEAR FLOAT | 282,72 | 102,40 | 0,36 | 5,80 | 5,00 | 10,50 | 2.969,60 |
| S 3 | ASAHIMAS 5 mm CLEAR FLOAT | 157,93 | - | - | 5,80 | 5,00 | - | - |
| S 4 | ASAHIMAS 12 mm PANASAP GREEN | 41,88 | 39,60 | 0,95 | 5,60 | 5,00 | 26,48 | 1.108,80 |
| S 5 | ASAHIMAS 12 mm PANASAP GREEN | 114,46 | 108,00 | 0,94 | 5,60 | 5,00 | 26,42 | 3.024,00 |
| | | 677,16 | 250,00 | 0,37 | | | | 7.102,40 |
| | | TOTAL | TOTAL | TOTAL | | | | TOTAL |

Sumber : Analisa Penulis, 2019

Tabel. Radiasi Melalui Bukaannya

| No | (WWR*SC*SF) | Total Area Fasad (m ²) | Total Area Bukaannya (m ²) | Window to Wall Ratio (WWR) | Solar Factor (SF) | Shading Coefficient (SC=Sck*Sceff) | OTTV | (A) x OTTV (Watt) |
|--------|---------------------------|------------------------------------|--|----------------------------|-------------------|------------------------------------|---------------|-------------------|
| | | (1) | (2) | (3) | | | | (7) |
| Façade | | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | | | = (2)/(1) | | | = (3)x(4)x(5) | = (1)x(6) |
| S 1 | ASAHIMAS 5 mm CLEAR FLOAT | 80,18 | - | - | 130,00 | 0,70 | - | - |

| | | | | | | | | |
|-----|---------------------------------|--------------|--------------|--------------|--------|------|-------|--------------|
| S 2 | ASAHIMAS 5 mm CLEAR FLOAT | 282,72 | 102,40 | 0,36 | 130,00 | 0,70 | 33,10 | 9.358,21 |
| S 3 | ASAHIMAS 5 mm CLEAR FLOAT | 157,93 | - | - | 130,00 | 0,70 | - | - |
| S 4 | ASAHIMAS 12 mm PANASAP GREEN | 41,88 | 39,60 | 0,95 | 130,00 | 0,50 | 61,47 | 2.574,00 |
| S 5 | ASAHIMAS 12 mm PANASAP GREEN | 114,46 | 108,00 | 0,94 | 130,00 | 0,50 | 61,33 | 7.020,00 |
| | | 677,16 | 250,00 | 0,37 | | | | 18.952,21 |
| | | TOTAL | TOTAL | TOTAL | | | | TOTAL |

Sumber : Analisa Penulis, 2019

4. Barat

Tabel. Tipe Kontruksi Dinding Exterior

| Type | Konstruksi | Warna |
|------|------------------|------------------|
| EW 1 | Brick Wall | Putih semi kilap |
| EW 2 | Concrete Precast | Abu-abu/biru tua |

Sumber : Analisa Penulis, 2019

Tabel. Spesifikasi Sistem Fenestrasi Exterior

| No | Kode Tipe Konstruksi Sistem Fenestrasi | Nama | SHGC | U Value (W/m ² K) | Peneduh Luar | Kode Spesifikasi Peneduh Luar | SC total SCxScef |
|----|---|---------------------------------|------|---------------------------------|-----------------|--|---------------------|
| 1 | F1 | ASAHIMAS 12 mm PANASAP GREEN | 0,43 | 5,6 | yes | SH1 | 0,47 |
| 2 | F2 | ASAHIMAS 12 mm PANASAP GREEN | 0,43 | 5,6 | yes | SH2 | 0,47 |

Sumber : Analisa Penulis, 2019

Tabel. Elemen Peneduh Luar Horizontal

| No | Kode Peneduh Luar | Panjang (P1) | Tinggi (H) | Kemiringan | Scef |
|----|-------------------|--------------|------------|------------|------|
| | Horisontal | [m] | [m] | [derajat] | |
| 1 | SH1 | 1,5 | 14,3 | 0 | 0,94 |
| 2 | SH2 | 1,5 | 14,3 | 0 | 0,94 |

Sumber : Analisa Penulis, 2019

Tabel. Identifikasi Fasad

| No | FASAD | Tinggi (jarak antar lantai) | Panjang | Area Fasad | Tipe Konstruksi Dinding | Kode Tipe Konstruksi Sistem Fenestrasi | Area Bukaannya | Total Jumlah Lantai | Total Area Fasad |
|----|-------|--------------------------------|---------|-------------------|-------------------------|--|-------------------|---------------------|------------------|
| | | [1] | | [2] | | | [3] | | |
| | | (m) | (m) | (m ²) | | | (m ²) | | |
| 1 | B 1 | 15,2 | 2,755 | 41,88 | EW 1 | F1 | 39,39 | 1 | 41,88 |
| 2 | B 2 | 15,2 | 23,26 | 353,55 | EW 1 | F1 | 0 | 1 | 353,55 |
| 3 | B 3 | 15,2 | 3,717 | 56,50 | EW 1 | F2 | 53,15 | 1 | 56,50 |
| 4 | B 4 | 15,2 | 14,925 | 226,86 | EW 1 | F1 | 0 | 1 | 226,86 |

Sumber : Analisa Penulis, 2019

Tabel. Konduksi Melalui Dinding

| No | $\alpha ((1-WWR) * U_w * T_{deq})$ | Total Area Fasad (m ²) | Heat Absorption Factor (α) | Total Area Bukaa n (m ²) | Window to Wall Ratio (WWR) | 1-WWR | U Value (U _w) wall (W/m ² k) | T _{Dek} | OTTV | (A) x OTTV (Watt) |
|-----|------------------------------------|------------------------------------|-------------------------------------|--------------------------------------|----------------------------|---------|---|------------------|------|-------------------|
| | Façade | (1) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| | | | | | = (5)/(1) | = 1-(6) | | | | |
| B 1 | Brick Wall | 41,88 | 0,30 | 39,39 | 0,94 | 0,06 | 2,80 | 10,00 | 0,50 | 20,86 |
| B 2 | Brick Wall | 353,55 | 0,30 | - | - | 1,00 | 2,80 | 10,00 | 8,39 | 2.967,19 |
| B 3 | Brick Wall | 56,50 | 0,30 | 53,15 | 0,94 | 0,06 | 2,80 | 10,00 | 0,50 | 28,10 |
| B 4 | Brick Wall | 226,86 | 0,30 | - | - | 1,00 | 2,80 | 10,00 | 8,39 | 1.903,92 |
| | | 678,79 | | 92,54 | 0,14 | | | | | 4.920,07 |
| | | TOTAL | | TOTAL | TOTAL | | | | | TOTAL |

Sumber : Analisa Penulis, 2019

Tabel. Konduksi Melalui Bukaannya

| No | (WWR*Uf*ΔT) | Total Area Fasad (m ²) | Total Area Bukaannya (m ²) | Window to Wall Ratio (WWR) | U Value Bukaannya (W/m ² K) | ΔT | OTTV | (A) x OTTV (Watt) |
|-----|------------------------------|------------------------------------|--|----------------------------|--|------|---------------|-------------------|
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | Façade | | = (2)/(1) | | | = (3)x(4)x(5) | = (1)x(6) |
| B 1 | ASAHIMAS 12 mm PANASAP GREEN | 41,88 | 39,39 | 0,94 | 5,60 | 5,00 | 26,34 | 1.102,92 |
| B 2 | ASAHIMAS 12 mm PANASAP GREEN | 353,55 | - | - | 5,60 | 5,00 | - | - |
| B 3 | ASAHIMAS 12 mm PANASAP GREEN | 56,50 | 53,15 | 0,94 | 5,60 | 5,00 | 26,34 | 1.488,20 |
| B 4 | ASAHIMAS 12 mm PANASAP GREEN | 226,86 | - | - | 5,60 | 5,00 | - | - |
| | | 678,79 | 92,54 | 0,14 | | | | 2.591,12 |
| | | TOTAL | TOTAL | TOTAL | | | | TOTAL |

Sumber : Analisa Penulis, 2019

Tabel. Radiasi Melalui Bukaannya

| No | (WWR*SC*SF) | Total Area Fasad (m ²) | Total Area Bukaannya (m ²) | Window to Wall Ratio (WWR) | Solar Factor (SF) | Shading Coefficient (SC=Sck*Sceff) | OTTV | (A) x OTTV (Watt) |
|-----|------------------------------|------------------------------------|--|----------------------------|-------------------|------------------------------------|---------------|-------------------|
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| | | Façade | | = (2)/(1) | | | = (3)x(4)x(5) | = (1)x(6) |
| B 1 | ASAHIMAS 12 mm PANASAP GREEN | 41,88 | 39,39 | 0,94 | 243,00 | 0,47 | 107,01 | 4.481,02 |
| B 2 | ASAHIMAS 12 mm PANASAP GREEN | 353,55 | - | - | 243,00 | 0,47 | - | - |
| B 3 | ASAHIMAS 12 mm PANASAP GREEN | 56,50 | 53,15 | 0,94 | 243,00 | 0,47 | 107,02 | 6.046,37 |
| B 4 | ASAHIMAS 12 mm PANASAP GREEN | 226,86 | - | - | 243,00 | 0,47 | - | - |
| | | 678,79 | 92,54 | 0,14 | | | | 10.527,39 |
| | | TOTAL | TOTAL | TOTAL | | | | TOTAL |

Sumber : Analisa Penulis, 2019

Berikut merupakan tabel penjabaran dari hasil simulasi pencahayaan alami yang dilakukan dengan software Velux Visualizer pada tanggal 21 juni.

1. Simulasi Lantai 1

Tabel. Hasil simulasi Daylight Factor Lantai 1

| Nama Ruang | Standar DF | Daylight Factor Rata-Rata | | | Nilai | |
|----------------------|------------|---------------------------|-------|-------|-----------------|---|
| | | 09.00 | 12.00 | 16.00 | | |
| Lab. Mat 6 (S) | 5 | 1 | 1 | 0.9 | Tidak Terpenuhi | 0 |
| Lab. Mat 5 (S) | 5 | 1.7 | 1.7 | 1.5 | Tidak Terpenuhi | 0 |
| Lab. Mat 4 (S) | 5 | 1.7 | 1.7 | 1.5 | Tidak Terpenuhi | 0 |
| Lab. Kalibrasi 1 (S) | 5 | 2.6 | 3.1 | 3 | Tidak Terpenuhi | 0 |
| Lab. Kalibrasi 2 (S) | 5 | 2.3 | 2.4 | 2.2 | Tidak Terpenuhi | 0 |
| Lab. Kalibrasi 3 (S) | 5 | 2.3 | 2.4 | 2.2 | Tidak Terpenuhi | 0 |
| Lab. Kalibrasi 4 (S) | 5 | 0.1 | 0.2 | 0.1 | Tidak Terpenuhi | 0 |
| Lab. Kalibrasi 5 (S) | 5 | 2.8 | 2.8 | 2.7 | Tidak Terpenuhi | 0 |
| Storage (S) | 1.5 | 1.5 | 1.7 | 1.6 | Terpenuhi | 1 |
| R. Teknisi (S) | 3.5 | 1 | 1.4 | 1.3 | Tidak Terpenuhi | 0 |
| R. Peneliti (S) | 3.5 | 0.9 | 1.5 | 1.4 | Tidak Terpenuhi | 0 |
| Lab. Mat 7 (S) | 5 | 0.5 | 0.7 | 0.6 | Tidak Terpenuhi | 0 |

| | | | | | | |
|-------------------|-----|-----|-----|-----|-----------------|----------|
| R. Preparasi (S) | 3.5 | 0.1 | 0.2 | 0.1 | Tidak Terpenuhi | 0 |
| R. Rapat (S) | 3 | 0 | 0 | 0 | Tidak Terpenuhi | 0 |
| Co Working Space | 1 | 1 | 1 | 1 | Terpenuhi | 1 |
| Lobby | 1 | 1.2 | 1.3 | 1.2 | Terpenuhi | 1 |
| R. Rapat (U) | 3 | 0 | 0 | 0 | Tidak Terpenuhi | 0 |
| R. Lab 1 (U) | 5 | 0.1 | 0.2 | 0.1 | Tidak Terpenuhi | 0 |
| Lab. Mat 8 (U) | 5 | 0.6 | 0.7 | 0.6 | Tidak Terpenuhi | 0 |
| R. Peneliti (U) | 3.5 | 0.8 | 1.2 | 0.8 | Tidak Terpenuhi | 0 |
| R. Teknisi (U) | 3.5 | 0.9 | 1.4 | 0.9 | Tidak Terpenuhi | 0 |
| Lab. Mat 3 (U) | 5 | 1.1 | 1.1 | 1 | Tidak Terpenuhi | 0 |
| Lab. Mat 2 (U) | 5 | 1.7 | 1.7 | 1.6 | Tidak Terpenuhi | 0 |
| Lab. Mat 1 (U) | 5 | 1.7 | 1.9 | 1.8 | Tidak Terpenuhi | 0 |
| R. Sample (U) | 3.5 | 2.1 | 2.1 | 2 | Tidak Terpenuhi | 0 |
| Total (25) | | | | | | 3 |

Sumber : Analisa Penulis, 2019

2. Simulasi Lantai 2

Tabel. Hasil simulasi Daylight Factor Lantai 2

| Nama Ruang | Standar DF | Daylight Factor Rata-Rata | | | Nilai | |
|--------------------|------------|---------------------------|-------|-------|-----------------|---|
| | | 09.00 | 12.00 | 16.00 | | |
| Lab. Chroma 4 (S) | 5 | 0.7 | 0.7 | 0.7 | Tidak Terpenuhi | 0 |
| Lab. Chroma 3 (S) | 5 | 0.8 | 0.8 | 0.8 | Tidak Terpenuhi | 0 |
| Lab. Chroma 2 (S) | 5 | 1 | 1 | 1 | Tidak Terpenuhi | 0 |
| Lab. Chroma 1 (S) | 5 | 1.2 | 1.3 | 1.2 | Tidak Terpenuhi | 0 |
| Storage (S) | 1.5 | 2 | 2 | 2 | Terpenuhi | 1 |
| R. Teknisi (S) | 3.5 | 0.6 | 0.8 | 0.6 | Tidak Terpenuhi | 0 |
| R. Peneliti (S) | 3.5 | 0.6 | 0.6 | 0.6 | Tidak Terpenuhi | 0 |
| R. Preparasi P (S) | 3.5 | 0.3 | 0.4 | 0.3 | Tidak Terpenuhi | 0 |
| R. Preparasi (S) | 3.5 | 0.1 | 0.1 | 0.1 | Tidak Terpenuhi | 0 |
| R. Rapat (S) | 3 | 0 | 0 | 0 | Tidak Terpenuhi | 0 |
| R. Kepala | 3.5 | 0.2 | 0.2 | 0.2 | Tidak Terpenuhi | 0 |
| R. Pengelola 1 | 3.5 | 0.5 | 0.5 | 0.5 | Tidak Terpenuhi | 0 |
| R. Pengelola 2 | 3.5 | 0.5 | 0.5 | 0.5 | Tidak Terpenuhi | 0 |

| | | | | | | |
|-------------------|-----|-----|-----|-----|-----------------|----------|
| R. Administrasi | 3.5 | 0.2 | 0.2 | 0.2 | Tidak Terpenuhi | 0 |
| R. Rapat 1 | 3 | 0.1 | 0.1 | 0.1 | Tidak Terpenuhi | 0 |
| R. Rapat 2 | 3 | 0.1 | 0.1 | 0.1 | Tidak Terpenuhi | 0 |
| Lobby | 1 | 1.7 | 1.8 | 1.8 | Terpenuhi | 1 |
| R. Rapat (U) | 3 | 0 | 0 | 0 | Tidak Terpenuhi | 0 |
| R. Preparasi (U) | 3.5 | 0.1 | 0.1 | 0.1 | Tidak Terpenuhi | 0 |
| Lab. Mat 14 (U) | 5 | 0.4 | 0.5 | 0.4 | Tidak Terpenuhi | 0 |
| R. Peneliti (U) | 3.5 | 0.5 | 0.6 | 0.5 | Tidak Terpenuhi | 0 |
| R. Teknisi (U) | 3.5 | 0.6 | 0.6 | 0.6 | Tidak Terpenuhi | 0 |
| Lab. 1 (U) | 5 | 1 | 0.1 | 1 | Tidak Terpenuhi | 0 |
| Lab. 2 (U) | 5 | 1 | 0.1 | 1 | Tidak Terpenuhi | 0 |
| Lab. 3 (U) | 5 | 1 | 0.2 | 1 | Tidak Terpenuhi | 0 |
| Lab. 4 (U) | 5 | 1.3 | 1 | 1.3 | Tidak Terpenuhi | 0 |
| Total (26) | | | | | | 2 |

Sumber : Analisa Penulis, 2019

3. Simulasi Lantai 3

Tabel. Hasil simulasi Daylight Factor Lantai 3

| Nama Ruang | Standar DF | Daylight Factor Rata-Rata | | | Nilai | |
|-------------------|------------|---------------------------|-------|-------|-----------------|---|
| | | 09.00 | 12.00 | 16.00 | | |
| Lab. 1 (S) | 5 | 0.6 | 0.7 | 0.6 | Tidak Terpenuhi | 0 |
| Lab. 2 (S) | 5 | 0.8 | 0.8 | 0.8 | Tidak Terpenuhi | 0 |
| Lab. Chroma 4 (S) | 5 | 0.8 | 1 | 0.8 | Tidak Terpenuhi | 0 |
| R. Bahan Alam (S) | 5 | 1.1 | 1.2 | 1.1 | Tidak Terpenuhi | 0 |
| Storage (S) | 1.5 | 2.5 | 2.6 | 2.6 | Memenuhi | 1 |
| R. Teknisi (S) | 3.5 | 0.7 | 0.8 | 0.7 | Tidak Terpenuhi | 0 |
| R. Peneliti (S) | 3.5 | 0.7 | 0.8 | 0.7 | Tidak Terpenuhi | 0 |
| R. Preparasi (S) | 3.5 | 0.4 | 0.4 | 0.4 | Tidak Terpenuhi | 0 |
| R. Rapat (S) | 3 | 0 | 0 | 0 | Tidak Terpenuhi | 0 |
| Pantry | 2.5 | 0.1 | 0.1 | 0.1 | Tidak Terpenuhi | 0 |
| Research Group 1 | 3.5 | 0.1 | 0.1 | 0.1 | Tidak Terpenuhi | 0 |
| R. Pelatihan 1 | 3.5 | 1.5 | 1.3 | 1.3 | Tidak Terpenuhi | 0 |
| R. Pelatihan 2 | 3.5 | 0.6 | 0.6 | 0.6 | Tidak Terpenuhi | 0 |

| | | | | | | |
|-------------------|-----|-----|-----|-----|-----------------|----------|
| R. Pelatihan 3 | 3.5 | 0.6 | 0.6 | 0.6 | Tidak Terpenuhi | 0 |
| R. Pelatihan 4 | 3.5 | 1.5 | 1.3 | 1.3 | Tidak Terpenuhi | 0 |
| Research Group 2 | 3.5 | 0.1 | 0.1 | 0.1 | Tidak Terpenuhi | 0 |
| Research Group 3 | 3.5 | 0.1 | 0.1 | 0.1 | Tidak Terpenuhi | 0 |
| Research Group 4 | 3.5 | 0.1 | 0.1 | 0.1 | Tidak Terpenuhi | 0 |
| R. Pelatihan 5 | 3.5 | 0.1 | 0.1 | 0.1 | Tidak Terpenuhi | 0 |
| Lobby | 1 | 1.6 | 1.6 | 1.6 | Memenuhi | 1 |
| R. Rapat (U) | 3 | 0 | 0 | 0 | Tidak Terpenuhi | 0 |
| R. Preparasi (U) | 3.5 | 0.3 | 0.3 | 0.3 | Tidak Terpenuhi | 0 |
| R. Peneliti (U) | 3.5 | 0.6 | 0.8 | 0.6 | Tidak Terpenuhi | 0 |
| R. Teknisi (U) | 3.5 | 0.6 | 0.8 | 0.6 | Tidak Terpenuhi | 0 |
| FTIR (U) | 5 | 0.7 | 0.7 | 0.7 | Tidak Terpenuhi | 0 |
| Lab. 3 (U) | 5 | 0.9 | 1 | 0.9 | Tidak Terpenuhi | 0 |
| R. Penelitian (U) | 3.5 | 1.4 | 1.4 | 1.4 | Tidak Terpenuhi | 0 |
| Total (27) | | | | | | 2 |

Sumber : Analisa Penulis, 2019

4. Simulasi Lantai 4

Tabel. Hasil simulasi Daylight Factor Lantai 4

| Nama Ruang | Standar DF | Daylight Factor Rata-Rata | | | Nilai | |
|-------------------|------------|---------------------------|-------|-------|-----------------|---|
| | | 09.00 | 12.00 | 16.00 | | |
| R. Kultur 2 (S) | 5 | 0.7 | 0.7 | 0.7 | Tidak Terpenuhi | 0 |
| R. Kultur 1 (S) | 5 | 0.9 | 0.9 | 0.9 | Tidak Terpenuhi | 0 |
| Lab. 1 (S) | 5 | 0.8 | 0.8 | 0.8 | Tidak Terpenuhi | 0 |
| Lab. 2 (S) | 5 | 0.7 | 0.7 | 0.7 | Tidak Terpenuhi | 0 |
| Lab. 3 (S) | 5 | 0.8 | 0.8 | 0.8 | Tidak Terpenuhi | 0 |
| R. Teknisi (S) | 3.5 | 0.7 | 0.5 | 0.7 | Tidak Terpenuhi | 0 |
| R. Preparasi (S) | 3.5 | 0.7 | 0.5 | 0.7 | Tidak Terpenuhi | 0 |
| Storage 1 | 1.5 | 3.2 | 3.2 | 3.2 | Terpenuhi | 1 |
| Storage 2 | 1.5 | 3.2 | 3.2 | 3.2 | Terpenuhi | 1 |
| Lobby | 1 | 0.6 | 0.6 | 0.6 | Tidak Terpenuhi | 0 |
| R. Rapat (U) | 3 | 0.5 | 0.5 | 0.5 | Tidak Terpenuhi | 0 |
| R. Preparasi (U) | 3.5 | 0.6 | 0.6 | 0.6 | Tidak Terpenuhi | 0 |
| R. Penelitian (U) | 3.5 | 1 | 1 | 1 | Tidak Terpenuhi | 0 |
| R. Peneliti (U) | 3.5 | 1 | 1 | 1 | Tidak Terpenuhi | 0 |

| | | | | | | |
|-------------------|-----|-----|-----|-----|-----------------|----------|
| R. Teknisi (U) | 3.5 | 1 | 1 | 1 | Tidak Terpenuhi | 0 |
| Lab. 4 (U) | 5 | 0.7 | 0.7 | 0.7 | Tidak Terpenuhi | 0 |
| Lab. 5 (U) | 5 | 0.8 | 0.8 | 0.8 | Tidak Terpenuhi | 0 |
| Lab. 6 (U) | 5 | 0.9 | 0.9 | 0.9 | Tidak Terpenuhi | 0 |
| Lab. 7 (U) | 5 | 0.7 | 0.7 | 0.7 | Tidak Terpenuhi | 0 |
| Lab. 8 (U) | 5 | 0.7 | 0.7 | 0.7 | Tidak Terpenuhi | 0 |
| Lab. 9 (U) | 5 | 0.9 | 0.9 | 0.9 | Tidak Terpenuhi | 0 |
| Lab. 10 (U) | 5 | 0.8 | 1 | 0.8 | Tidak Terpenuhi | 0 |
| Total (22) | | | | | | 2 |

Sumber : Analisa Penulis, 2019



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Bismillaahirrahmaanirrahim

Assalamu'alaikum wr. wb.

Dengan ini menerangkan bahwa:

Nama : Rizqi Anggraini, S.Ars.

Nomor Mahasiswa : 18515020

Dosen Pembimbing : Ahmad Saifudin Mutaqi, Ir., M.T., IAI., AA.

Fakultas / Prodi : FTSP / Profesi Arsitek

Judul Karya Ilmiah : EVALUASI PENERAPAN EFISIENSI DAN KONSERVASI
ENERGI PADA GEDUNG LABORATORIUM PENELITIAN
DAN PENGUJIAN TERPADU UGM

Karya ilmiah yang bersangkutan di atas telah melalui proses cek plagiasi menggunakan **Turnitin** dengan hasil kemiripan (*similarity*) sebesar **20 (Dua Puluh) %**

Demikian surat keterangan ini dibuat agar dapat dipergunakan sebagaimana mestinya.

Wassalamu'alaikum wr. wb

Yogyakarta, 22 November 2019

Direktur Direktorat Perpustakaan



Joko Sugeng Priantoro
Joko Sugeng Priantoro, S.IP., M.Hum.