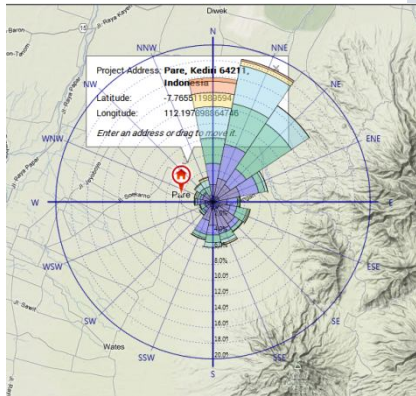
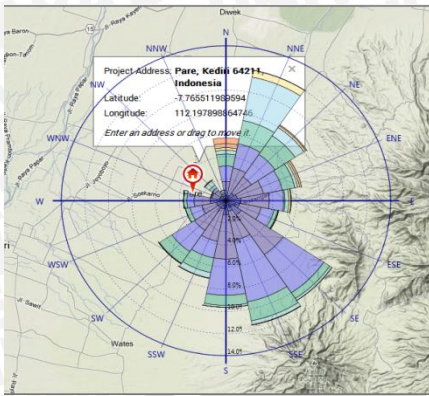


LAMPIRAN

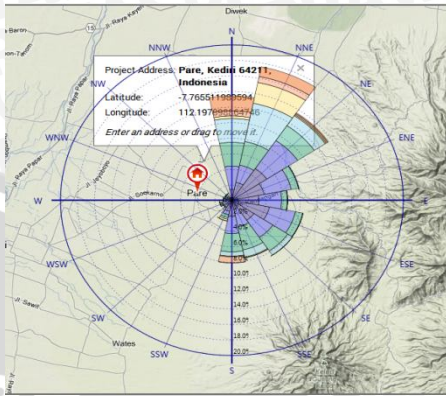
repository.ub.ac.id



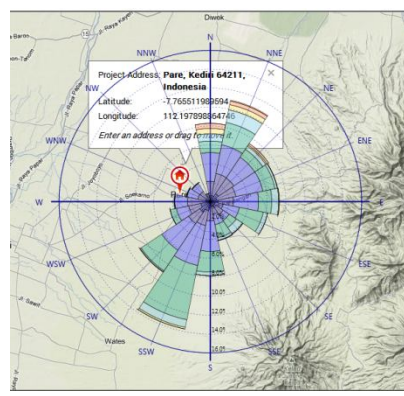
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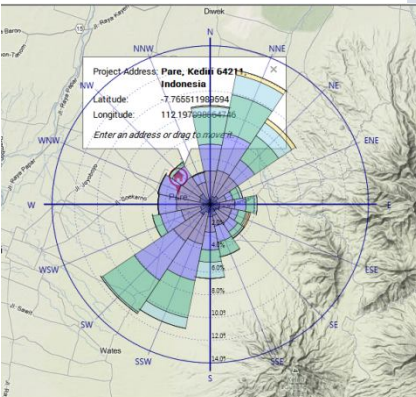
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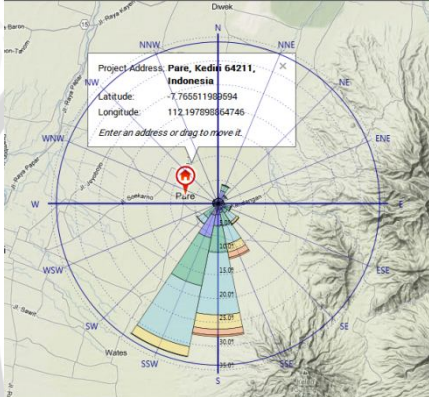
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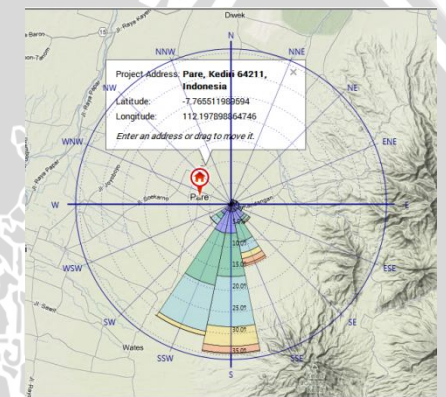
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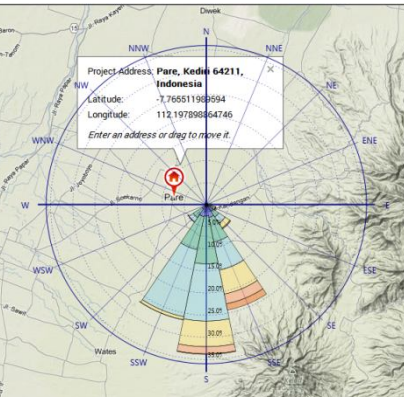
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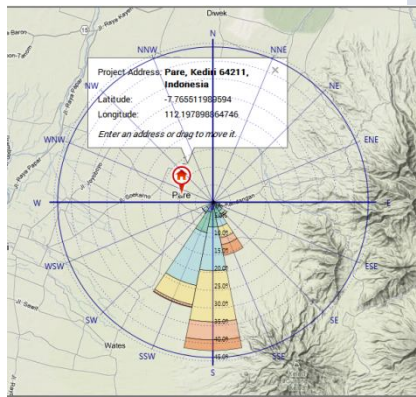
Juni



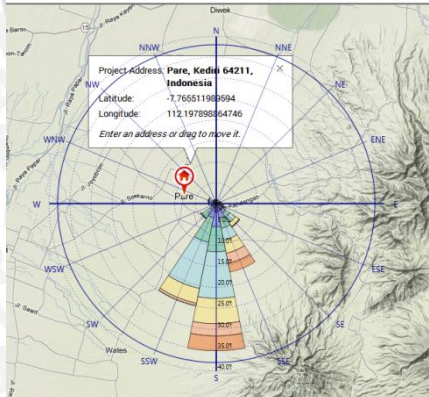
Juli



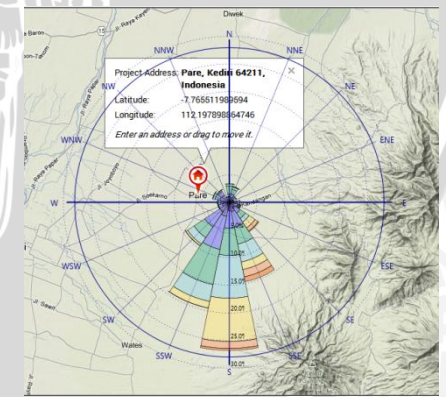
Agustus



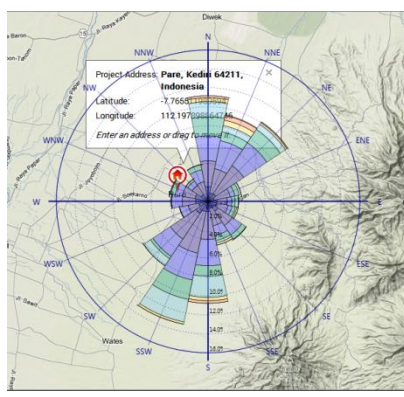
September



Oktober



November



Desember

Gambar rata-rata kecepatan angin pada objek studi (Autodesk Vasari Beta)

UNIVERSITAS BRAWIJAYA



Lampiran Analisa Kenyamanan Ruang dengan *software Comfort*

Ruang Kelas

07.00-10.00

Waktu

10.00-12.00

13.00-15.00

1

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 31.2 °C

MRT Link with Air: 31.2 °C

Air Velocity: 0.10 m/s

Relative Humidity: 64 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 32.3 °C **Too Humid**

SET*: 31.9 °C

TSENS: 1.2

DISC: 1.9 **Uncomfortable**

PMV: 2.11 **above ISO**

PPD: 81 %

PD: 3 %

PS: 0 %

TS: 1.9

Tneutral: 21.9 (Humphreys)

Tneutral: 26.3 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 30.0 °C

MRT Link with Air: 30.0 °C

Air Velocity: 0.10 m/s

Relative Humidity: 62 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 30.7 °C **Too Humid**

SET*: 30.2 °C

TSENS: 0.9

DISC: 1.3 **Slightly Uncomfortable**

PMV: 1.62 **above ISO**

PPD: 57 %

PD: 4 %

PS: 0 %

TS: 1.5

Tneutral: 21.9 (Humphreys)

Tneutral: 25.7 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 32.0 °C

MRT Link with Air: 32.0 °C

Air Velocity: 0.10 m/s

Relative Humidity: 65 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 33.3 °C **Too Humid**

SET*: 33.1 °C

TSENS: 1.4

DISC: 2.3 **Uncomfortable**

PMV: 2.44 **above ISO**

PPD: 92 %

PD: 2 %

PS: 0 %

TS: 2.1

Tneutral: 21.9 (Humphreys)

Tneutral: 26.7 (Auliciems)

2

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 31.0 °C

MRT Link with Air: 31.0 °C

Air Velocity: 0.10 m/s

Relative Humidity: 68 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 32.4 °C **Too Humid**

SET*: 32.0 °C

TSENS: 1.2

DISC: 2.0 **Uncomfortable**

PMV: 2.08 **above ISO**

PPD: 80 %

PD: 3 %

PS: 0 %

TS: 1.9

Tneutral: 21.9 (Humphreys)

Tneutral: 26.2 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 32.6 °C

MRT Link with Air: 32.6 °C

Air Velocity: 0.10 m/s

Relative Humidity: 68 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 34.4 °C **Too Humid**

SET*: 34.3 °C

TSENS: 1.6

DISC: 2.8 **Very Uncomfortable**

PMV: 2.72 **above ISO**

PPD: 97 %

PD: 2 %

PS: 0 %

TS: 2.3

Tneutral: 21.9 (Humphreys)

Tneutral: 27.0 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 33.0 °C

MRT Link with Air: 33.0 °C

Air Velocity: 0.10 m/s

Relative Humidity: 66 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 34.7 °C **Too Humid**

SET*: 34.5 °C

TSENS: 1.6

DISC: 2.9 **Very Uncomfortable**

PMV: 2.86 **above ISO**

PPD: 98 %

PD: 1 %

PS: 0 %

TS: 2.4

Tneutral: 21.9 (Humphreys)

Tneutral: 27.2 (Auliciems)

3

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 31.2 °C

MRT Link with Air: 31.2 °C

Air Velocity: 0.80 m/s

Relative Humidity: 64 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 32.0 °C **Too Humid**

SET*: 28.2 °C

TSENS: 0.7

DISC: 0.9 **Slightly Uncomfortable**

PMV: 1.75 **above ISO**

PPD: 64 %

PD: 36 %

PS: 45 %

TS: 1.9

Tneutral: 21.9 (Humphreys)

Tneutral: 26.3 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 30.0 °C

MRT Link with Air: 30.0 °C

Air Velocity: 0.80 m/s

Relative Humidity: 63 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 30.5 °C **Too Humid**

SET*: 26.7 °C

TSENS: 0.4

DISC: 0.5 **Slightly Uncomfortable**

PMV: 1.11 **above ISO**

PPD: 31 %

PD: 52 %

PS: 61 %

TS: 1.5

Tneutral: 21.9 (Humphreys)

Tneutral: 25.7 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 32.4 °C

MRT Link with Air: 32.4 °C

Air Velocity: 0.89 m/s

Relative Humidity: 65 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 33.5 °C **Too Humid**

SET*: 29.6 °C

TSENS: 1.0

DISC: 1.4 **Slightly Uncomfortable**

PMV: 2.38 **above ISO**

PPD: 91 %

PD: 24 %

PS: 32 %

TS: 2.2

Tneutral: 21.9 (Humphreys)

Tneutral: 26.9 (Auliciems)

4

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 28.0 °C

MRT Link with Air: 28.0 °C

Air Velocity: 0.10 m/s

Relative Humidity: 60 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 28.3 °C **Too Humid**

SET*: 27.6 °C

TSENS: 0.5

DISC: 0.6 **Slightly Uncomfortable**

PMV: 0.82 **above ISO**

PPD: 19 %

PD: 7 %

PS: 1 % **Not enough air movement**

TS: 0.9

Tneutral: 21.9 (Humphreys)

Tneutral: 24.8 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 34.7 °C

MRT Link with Air: 34.7 °C

Air Velocity: 0.10 m/s

Relative Humidity: 63 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 36.4 °C **Too Humid**

SET*: 36.4 °C

TSENS: 2.0

DISC: 3.7 **Limited Tolerance**

PMV: 3.51 **above ISO**

PPD: 100 %

PD: 0 %

PS: 0 %

TS: 2.9

Tneutral: 21.9 (Humphreys)

Tneutral: 28.0 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions

Air Temperature: 31.5 °C

MRT Link with Air: 31.5 °C

Air Velocity: 0.10 m/s

Relative Humidity: 63 %

Summer Winter

Activity

ASHRAE Standard 55

Metabolic Rate: 1.0 met

Clothing

ASHRAE Standard 55 Summer

Clothing level: 0.50 clo

Results

ET*: 32.5 °C **Too Humid**

SET*: 32.2 °C

TSENS: 1.3

DISC: 2.0 **Uncomfortable**

PMV: 2.22 **above ISO**

PPD: 86 %

PD: 3 %

PS: 0 %

TS: 2.0

Tneutral: 21.9 (Humphreys)

Tneutral: 26.4 (Auliciems)

5

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 31.1 °C	ET*: 32.0 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 31.1 °C	SET*: 31.6 °C
Air Velocity: 0.10 m/s	TSENS: 1.2
Relative Humidity: 62 %	DISC: 1.8 Uncomfortable
Activity	PMV: 2.05 Uncomfortable
ASHRAE Standard 55	PPD: 79 %
Metabolic Rate: 1.0 met	PD: 3 %
Clothing	PS: 0 %
ASHRAE Standard 55 Summer	TS: 1.8
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 26.2 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 32.8 °C	ET*: 34.7 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 32.8 °C	SET*: 34.5 °C
Air Velocity: 0.10 m/s	TSENS: 1.6
Relative Humidity: 68 %	DISC: 2.9 Uncomfortable
Activity	PMV: 2.80 Uncomfortable
ASHRAE Standard 55	PPD: 98 %
Metabolic Rate: 1.0 met	PD: 1 %
Clothing	PS: 0 %
ASHRAE Standard 55 Summer	TS: 2.4
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 27.1 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 31.6 °C	ET*: 32.7 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 31.6 °C	SET*: 32.3 °C
Air Velocity: 0.10 m/s	TSENS: 1.3
Relative Humidity: 63 %	DISC: 2.0 Uncomfortable
Activity	PMV: 2.26 Uncomfortable
ASHRAE Standard 55	PPD: 87 %
Metabolic Rate: 1.0 met	PD: 3 %
Clothing	PS: 0 %
ASHRAE Standard 55 Summer	TS: 2.0
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 26.5 (Auliciems)

5

Lampiran analisis kecepatan angin yang diperlukan dalam ruang dengan software *Comfort*

Ruang Kelas

Waktu

07.00-10.00

10.00-12.00

13.00-15.00

1

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 30.0 °C	ET*: 30.5 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 30.0 °C	SET*: 26.7 °C
Air Velocity: 0.85 m/s	TSENS: 0.4
Relative Humidity: 64 %	DISC: 0.5 Comfortable
Activity	PMV: 1.10 Uncomfortable
ASHRAE Standard 55	PPD: 31 %
Metabolic Rate: 1.0 met	PD: 57 %
Clothing	PS: 64 %
ASHRAE Standard 55 Summer	TS: 1.5
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 25.7 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 30.0 °C	ET*: 30.5 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 30.0 °C	SET*: 26.7 °C
Air Velocity: 0.80 m/s	TSENS: 0.4
Relative Humidity: 62 %	DISC: 0.5 Comfortable
Activity	PMV: 1.10 Uncomfortable
ASHRAE Standard 55	PPD: 30 %
Metabolic Rate: 1.0 met	PD: 52 %
Clothing	PS: 61 %
ASHRAE Standard 55 Summer	TS: 1.5
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 25.7 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 30.0 °C	ET*: 30.6 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 30.0 °C	SET*: 26.6 °C
Air Velocity: 0.90 m/s	TSENS: 0.4
Relative Humidity: 65 %	DISC: 0.5 Comfortable
Activity	PMV: 1.10 Uncomfortable
ASHRAE Standard 55	PPD: 30 %
Metabolic Rate: 1.0 met	PD: 62 %
Clothing	PS: 66 %
ASHRAE Standard 55 Summer	TS: 1.6
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 25.7 (Auliciems)

2

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 30.0 °C	ET*: 30.7 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 30.0 °C	SET*: 26.6 °C
Air Velocity: 1.00 m/s	TSENS: 0.3
Relative Humidity: 68 %	DISC: 0.5 Comfortable
Activity	PMV: 1.10 Uncomfortable
ASHRAE Standard 55	PPD: 30 %
Metabolic Rate: 1.0 met	PD: 72 %
Clothing	PS: 70 %
ASHRAE Standard 55 Summer	TS: 1.6
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 25.7 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 32.6 °C	ET*: 33.7 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 32.6 °C	SET*: 28.6 °C
Air Velocity: 3.00 m/s	TSENS: 0.8
Relative Humidity: 68 %	DISC: 1.2 Slightly Uncomfortable
Activity	PMV: 2.39 Uncomfortable
ASHRAE Standard 55	PPD: 91 %
Metabolic Rate: 1.0 met	PD: 100 %
Clothing	PS: 33 %
ASHRAE Standard 55 Summer	TS: 2.3
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 27.0 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 33.0 °C	ET*: 34.1 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 33.0 °C	SET*: 29.0 °C
Air Velocity: 3.00 m/s	TSENS: 0.8
Relative Humidity: 66 %	DISC: 1.3 Slightly Uncomfortable
Activity	PMV: 2.62 Uncomfortable
ASHRAE Standard 55	PPD: 96 %
Metabolic Rate: 1.0 met	PD: 94 %
Clothing	PS: 28 %
ASHRAE Standard 55 Summer	TS: 2.4
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 27.2 (Auliciems)

3

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 31.2 °C	ET*: 31.7 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 31.2 °C	SET*: 26.5 °C
Air Velocity: 3.00 m/s	TSENS: 0.4
Relative Humidity: 64 %	DISC: 0.5 Slightly Uncomfortable
Activity	PMV: 1.46 Uncomfortable
ASHRAE Standard 55	PPD: 49 %
Metabolic Rate: 1.0 met	PD: 100 %
Clothing	PS: 53 %
ASHRAE Standard 55 Summer	TS: 1.9
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 26.3 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 30.0 °C	ET*: 30.5 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 30.0 °C	SET*: 26.6 °C
Air Velocity: 0.85 m/s	TSENS: 0.4
Relative Humidity: 63 %	DISC: 0.5 Comfortable
Activity	PMV: 1.09 Uncomfortable
ASHRAE Standard 55	PPD: 30 %
Metabolic Rate: 1.0 met	PD: 57 %
Clothing	PS: 64 %
ASHRAE Standard 55 Summer	TS: 1.5
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 25.7 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions	Results
Air Temperature: 32.4 °C	ET*: 33.3 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air: 32.4 °C	SET*: 28.1 °C
Air Velocity: 3.00 m/s	TSENS: 0.7
Relative Humidity: 65 %	DISC: 1.0 Slightly Uncomfortable
Activity	PMV: 2.23 Uncomfortable
ASHRAE Standard 55	PPD: 86 %
Metabolic Rate: 1.0 met	PD: 100 %
Clothing	PS: 36 %
ASHRAE Standard 55 Summer	TS: 2.2
Clothing level: 0.50 clo	Tneutral: 21.9 (Humphreys)
	Tneutral: 26.9 (Auliciems)

4

Basic Thermal Comfort Model Parameters

Environmental Conditions		Results	
Air Temperature	28.0 °C	ET*	28.2 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air	28.0 °C	SET*	26.0 °C
Air Velocity	0.30 m/s	TSENS	0.1
Relative Humidity	60 %	DISC	0.2 Comfortable
Activity	ASHRAE Standard 55	PMV	0.45
Metabolic Rate	1.0 met	PPD	9 %
Clothing	ASHRAE Standard 55 Summer	PD	21 %
Clothing level	0.50 clo	PS	44 % Not enough air movement
		TS	0.9
		Tneutral	21.9 (Humphreys)
		Tneutral	24.8 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions		Results	
Air Temperature	34.7 °C	ET*	35.9 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air	34.7 °C	SET*	31.0 °C
Air Velocity	3.00 m/s	TSENS	1.3
Relative Humidity	63 %	DISC	2.1 Uncomfortable
Activity	ASHRAE Standard 55	PMV	3.65 above ISO
Metabolic Rate	1.0 met	PPD	100 %
Clothing	ASHRAE Standard 55 Summer	PD	0 %
Clothing level	0.50 clo	PS	3 %
		TS	2.9
		Tneutral	21.9 (Humphreys)
		Tneutral	28.0 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions		Results	
Air Temperature	31.5 °C	ET*	32.1 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air	31.5 °C	SET*	26.8 °C
Air Velocity	3.00 m/s	TSENS	0.4
Relative Humidity	63 %	DISC	0.6 Slightly Uncomfortable
Activity	ASHRAE Standard 55	PMV	1.64 above ISO
Metabolic Rate	1.0 met	PPD	58 %
Clothing	ASHRAE Standard 55 Summer	PD	100 %
Clothing level	0.50 clo	PS	49 %
		TS	2.0
		Tneutral	21.9 (Humphreys)
		Tneutral	26.4 (Auliciems)

5

Basic Thermal Comfort Model Parameters

Environmental Conditions		Results	
Air Temperature	31.1 °C	ET*	31.6 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air	31.1 °C	SET*	26.5 °C
Air Velocity	2.40 m/s	TSENS	0.4
Relative Humidity	62 %	DISC	0.5 Comfortable
Activity	ASHRAE Standard 55	PMV	1.42 above ISO
Metabolic Rate	1.0 met	PPD	47 %
Clothing	ASHRAE Standard 55 Summer	PD	100 %
Clothing level	0.50 clo	PS	64 %
		TS	1.8
		Tneutral	21.9 (Humphreys)
		Tneutral	26.2 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions		Results	
Air Temperature	32.8 °C	ET*	34.0 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air	32.8 °C	SET*	28.9 °C
Air Velocity	3.00 m/s	TSENS	0.8
Relative Humidity	68 %	DISC	1.3 Slightly Uncomfortable
Activity	ASHRAE Standard 55	PMV	2.52 above ISO
Metabolic Rate	1.0 met	PPD	94 %
Clothing	ASHRAE Standard 55 Summer	PD	100 %
Clothing level	0.50 clo	PS	31 %
		TS	2.4
		Tneutral	21.9 (Humphreys)
		Tneutral	27.1 (Auliciems)

Basic Thermal Comfort Model Parameters

Environmental Conditions		Results	
Air Temperature	31.6 °C	ET*	32.2 °C Too Humid
MRT <input checked="" type="checkbox"/> Link with Air	31.6 °C	SET*	26.9 °C
Air Velocity	3.00 m/s	TSENS	0.5
Relative Humidity	63 %	DISC	0.6 Slightly Uncomfortable
Activity	ASHRAE Standard 55	PMV	1.70 above ISO
Metabolic Rate	1.0 met	PPD	62 %
Clothing	ASHRAE Standard 55 Summer	PD	100 %
Clothing level	0.50 clo	PS	47 %
		TS	2.0
		Tneutral	21.9 (Humphreys)
		Tneutral	26.5 (Auliciems)

