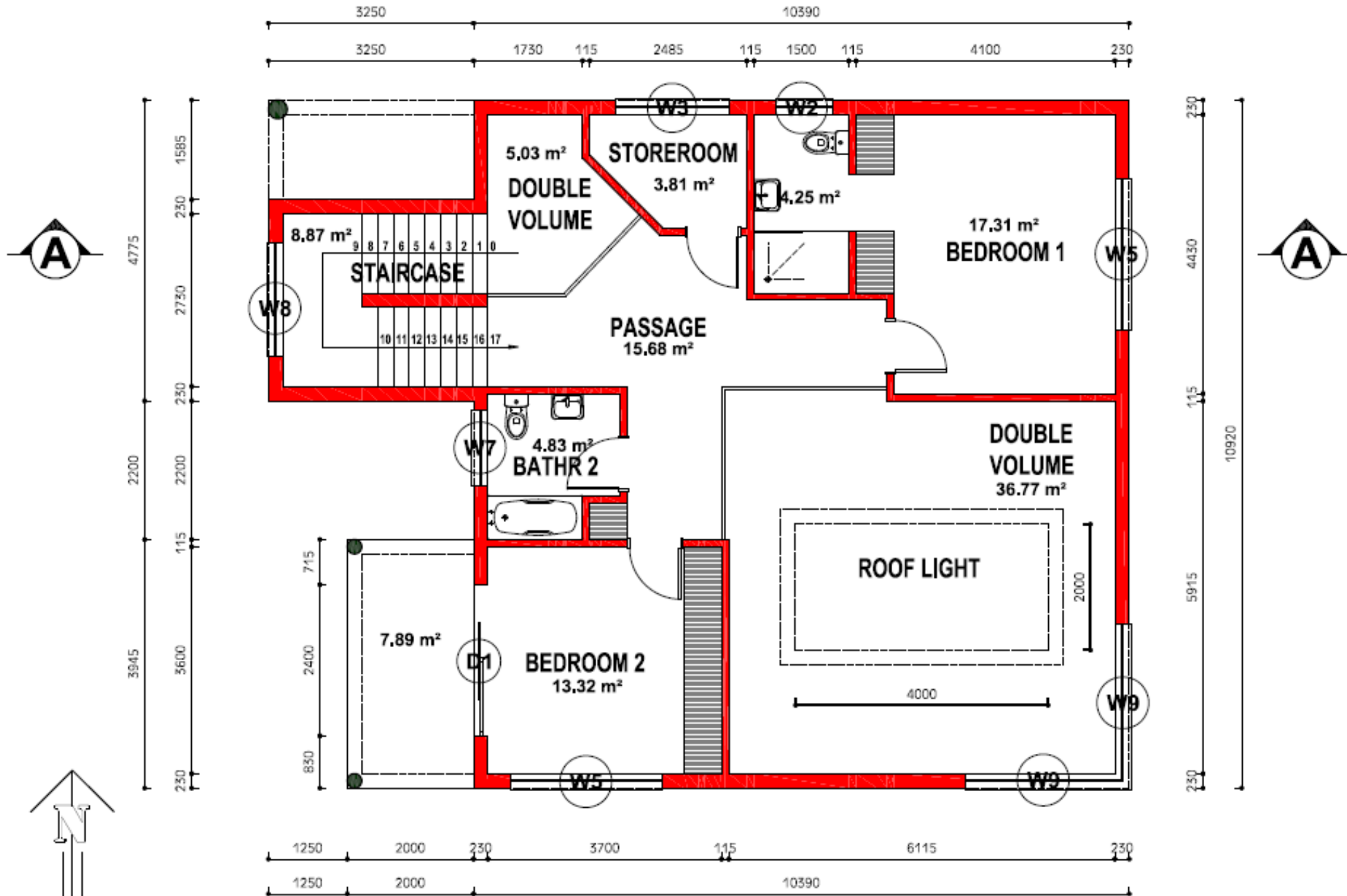
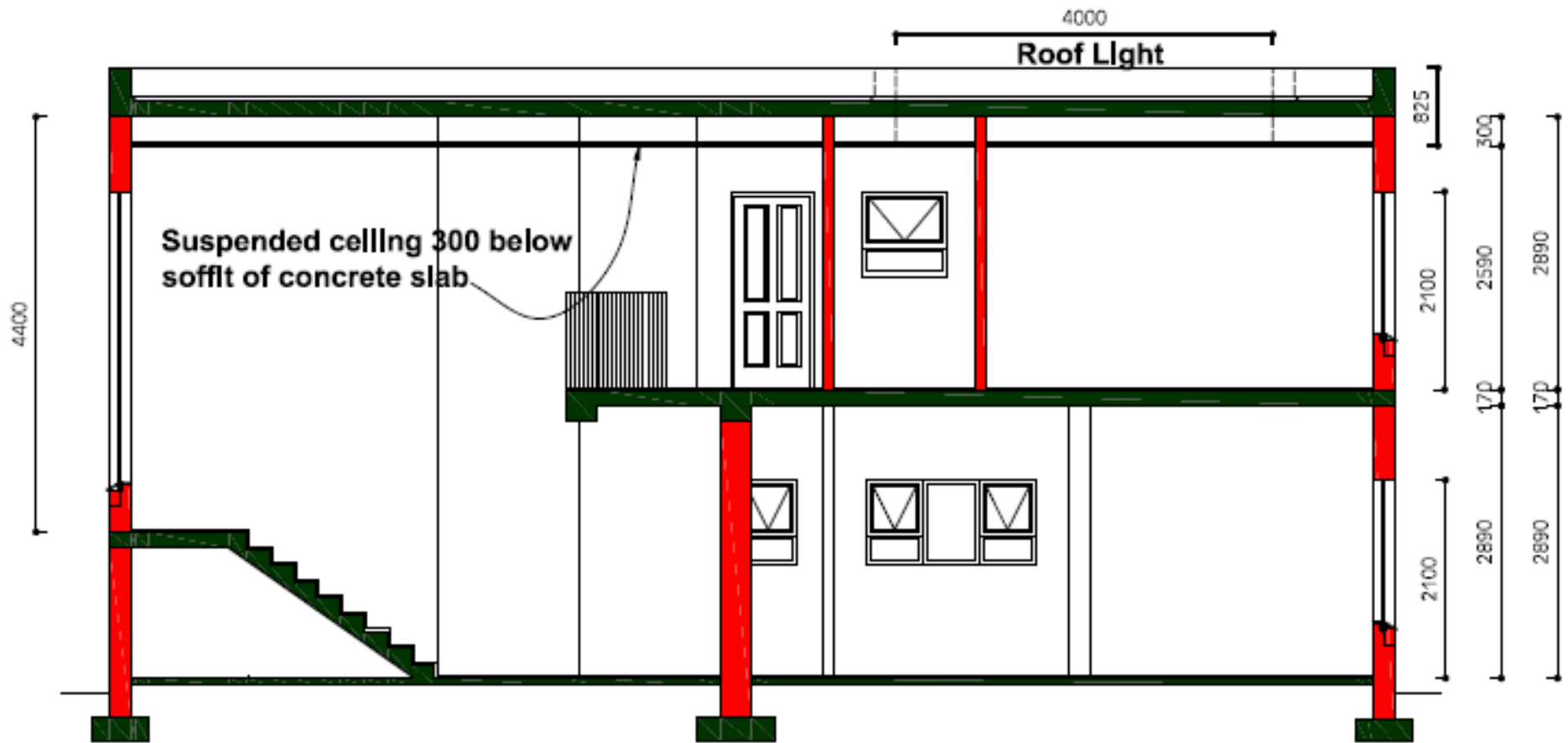


GROUND STOREY LAYOUT
Scale 1: 75



FIRST STOREY LAYOUT
Scale 1: 75



SECTION AA
Scale 1: 75

Window frames set back 100mm into masonry wall

DOOR SCHEDULE		WINDOW SCHEDULE			
DRAWING	<p>D1</p>	<p>W1</p>	<p>W2</p>	<p>W3</p>	<p>W4</p>
AREA (m ²)	Opening: 5.04 Glass: 5.04	Opening: 1.62 Glass: 1.62	Opening: 0.81 Glass: 0.81	Opening: 1.62 Glass: 1.62	Opening: 3.60 Glass: 3.60
FRAME	Clear aluminium for 2400 × 2100 opening	PTT1809 Coated aluminium	PT0909 Coated aluminium	PT1809 Coated aluminium	PTT2415 Coated aluminium
GLASS	Clear laminated safety glass Fixed to panels with beading and seals provided	Clear glass Fixed to panels with beading and seals provided	Clear glass Fixed to panels with beading and seals provided	Clear glass Fixed to panels with beading and seals provided	Clear glass Fixed to panels with beading and seals provided
VALUE	U: 7.9 SHGC: 0.81	U: 7.9 SHGC: 0.81	U: 7.9 SHGC: 0.81	U: 7.9 SHGC: 0.81	U: 7.9 SHGC: 0.81

WINDOW SCHEDULE

DRAWING					
AREA (m ²)	Opening: 3.60 Glass: 3.60	Opening: 1.08 Glass: 1.08	Opening: 1.08 Glass: 1.08	Opening: 5.58 Glass: 5.58	Opening: 11.04 Glass: 11.04
FRAME	PTT2415 Coated aluminium	PT1209 Coated aluminium	PT1209 Coated aluminium	PT1831 Coated aluminium with external vertical louvres to exclude 80% of SSR	PT2446 Coated aluminium with external vertical louvres to exclude 80% of SSR
GLASS	Clear glass Fixed to panels with beading and seals provided	Clear glass Fixed to panels with beading and seals provided	Clear glass Fixed to panels with beading and seals provided	Clear Laminated safety glass Fixed to panels with beading and seals provided	Clear Laminated safety glass Fixed to panels with beading and seals provided
VALUE	U: 7.9 SHGC: 0.81	U: 7.9 SHGC: 0.81	U: 7.9 SHGC: 0.81	U: 7.9 SHGC: 0.81	U: 7.9 SHGC: 0.81

NATURAL VENTILATION

GROUND STOREY

Nett floor area: 114.99

Fenestration area: $26.82 + 8.00 = 34.82$

Window to floor area ratio for Ground Storey is 30.28 %

Roof light: $8/36.77 \times 100 = 21.76\%$

Therefore U-value ≤ 2.5

SHGC value ≤ 0.25

CONSTANTS

Conductance Constant for Ground Storey is $114.99 \times 1.40 = 160.99$

SHG Constant for Ground Storey is $114.99 \times 0.12 = 13.80$

CONDUCTANCE

Conductance of Window 1 is $1.62 \times 7.90 = 12.80$

Conductance of Window 1 is $1.62 \times 7.90 = 12.80$

Conductance of Window 4 is $3.60 \times 7.90 = 28.44$

Conductance of Window 9 is $6.00 \times 7.90 = 47.40$

Conductance of Window 9 is $6.00 \times 7.90 = 47.40$

Conductance of Window 4 is $3.60 \times 7.90 = 28.44$

Conductance of Window 6 is $1.08 \times 7.90 = 08.53$

Conductance of Window 8 is $1.80 \times 7.90 = 14.22$

Total Conductance for Ground Storey is 200.03 (> 160.99)

Conductance of Ground Storey FAILS!

CONDUCTANCE

Change glass of W8 and W9 to Clear Double Low E

Conductance of Window 1 is $1.62 \times 7.90 = 12.80$

Conductance of Window 1 is $1.62 \times 7.90 = 12.80$

Conductance of Window 4 is $3.60 \times 7.90 = 28.44$

Conductance of Window 9 is $6.00 \times 3.40 = 20.40$

Conductance of Window 9 is $6.00 \times 3.40 = 20.40$

Conductance of Window 4 is $3.60 \times 7.90 = 28.44$

Conductance of Window 6 is $1.08 \times 7.90 = 08.53$

Conductance of Window 8 is $1.80 \times 3.40 = 06.12$

Total Conductance for Ground Storey is 137.93 (< 160.99)

Conductance of Ground Storey PASS!

SOLAR HEAT GAIN

NORTH

Solar heat gain of Window 1

(P=0.10, H=0.90, G=0.00, P/H=0.11)

$$1.62 \times 0.81 \times 0.63 = 0.83$$

$$0.83 \times 2 = 1.66$$

EAST

Solar heat gain of Window 4

$P=0.10$, $H=1.50$, $G=0.00$, $P/H=0.07$

$$3.60 \times 0.81 \times 1.07 = 3.12$$

Solar heat gain of Window 9

$P/H=1.60$ (80% of 2 = 1.6)

$$6.00 \times 0.66 \times 0.29 = 1.15$$

SOUTH

Solar heat gain of Window 4

P=0.10, H=1.50, G=0.00, P/H=0.07)

$$3.60 \times 0.81 \times 0.57 = 1.66$$

Solar heat gain of Window 9

P/H=1.60 (80% of 2 = 1.6)

$$6.00 \times 0.66 \times 0.18 = 0.71$$

WEST

Solar heat gain of Window 6

P=0.10, H=0.9, G=0.00, P/H=0.11)

$$1.08 \times 0.81 \times 1.11 = 0.97$$

Solar heat gain of Window 8

P/H=1.60 (80% of 2 = 1.6)

$$1.80 \times 0.66 \times 0.30 = 0.36$$

Total Solar Heat Gain for Ground Storey:

$$1.66 + 3.12 + 1.15 + 1.66 + 0.71 + 0.97 + 0.36 = 9.63 (<13.80)$$

Solar Heat Gain for Ground Storey PASS!

FIRST STOREY

Nett floor area: 109.87

Fenestration area: $29.61 + 8.00 = 37.61$

Window to floor area ratio for Ground Storey is 34.23 %

CONSTANTS

Conductance Constant for First Storey is $109.87 \times 1.40 = 153.82$

SHG Constant for First Storey is $109.87 \times 0.12 = 13.18$

CONDUCTANCE

Conductance of Window 3 is $1.62 \times 7.90 = 12.80$

Conductance of Window 2 is $0.81 \times 7.90 = 06.40$

Conductance of Window 5 is $3.60 \times 7.90 = 28.44$

Conductance of Window 9 is $5.04 \times 3.40 = 17.14$

Conductance of Window 9 is $5.04 \times 3.40 = 17.14$

Conductance of Window 5 is $3.60 \times 7.90 = 28.44$

Conductance of Door 1 is $5.04 \times 7.90 = 39.82$

Conductance of Window 7 is $1.08 \times 7.90 = 8.53$

Conductance of Window 8 is $3.78 \times 3.04 = 12.85$

Total Conductance for First Storey is 171.56 (>153.82)

Conductance for First Storey FAILS!

CONDUCTANCE

Change Glass of W5 to Clear Double Low E

Conductance of Window 3 is $1.62 \times 7.90 = 12.80$

Conductance of Window 2 is $0.81 \times 7.90 = 06.40$

Conductance of Window 5 is $3.60 \times 3.40 = 12.24$

Conductance of Window 9 is $5.04 \times 3.40 = 17.14$

Conductance of Window 9 is $5.04 \times 3.40 = 17.14$

Conductance of Window 5 is $3.60 \times 3.40 = 12.24$

Conductance of Door 1 is $5.04 \times 7.90 = 39.82$

Conductance of Window 7 is $1.08 \times 7.90 = 8.53$

Conductance of Window 8 is $3.78 \times 3.40 = 12.85$

Total Conductance for First Storey is 139.16 (<153.82)

Conductance for First Storey PASS!

SOLAR HEAT GAIN

NORTH

Solar heat gain of Window 3

P=0.10, H=0.90, G=0.00, P/H=0.11

$$1.62 \times 0.81 \times 0.63 = 0.83$$

Solar heat gain of Window 2

P=0.10, H = 0.90, G=0.00, P/H=0.11

$$0.81 \times 0.81 \times 0.63 = 0.41$$

EAST

Solar heat gain of Window 5

P=0.10, H=1.50, G=0.00, P/H=0.07)

$$3.60 \times 0.66 \times 1.07 = 2.54$$

Solar heat gain of Window 9

P/H=1.60 (80% of 2 = 1.6)

$$5.04 \times 0.66 \times 0.29 = 0.96$$

SOUTH

Solar heat gain of Window 9

P/H=1.60 (80% of 2 = 1.6)

$$5.04 \times 0.66 \times 0.18 = 0.60$$

Solar heat gain of Window 5

P=0.10, H=1.50, G=0.00, P/H=0.07

$$3.60 \times 0.66 \times 0.57 = 1.35$$

WEST

Solar heat gain of Door 1

P=0.72, H=2.89, G=0.62, P/H=0.13

$$5.04 \times 0.81 \times 1.11 = 4.58$$

Solar heat gain of Window 7

P=0.10, H=0.90, G=0.00, P/H=0.11

$$1.08 \times 0.81 \times 1.11 = 0.97$$

Solar heat gain of Window 8

P/H=1.60 (80% of 2 = 1.6)

$$3.78 \times 0.66 \times 0.30 = 0.75$$

Total Solar Heat Gain for First Storey:

$$0.83 + 0.41 + 2.54 + 0.96 + 0.60 + 1.35 + 4.58 + 0.97 + 0.75 = 12.99 (<13.18)$$

Solar Heat Gain for First Storey PASS!

ARTIFICIAL VENTILATION

$$\text{FAÇADE HEIGHT: } 3.06 + 2.59 = 5.65$$

ENERGY INDEX

NORTHERN FAÇADE

$$10.39 \times 5.65 \times 0.257 = 15.09$$

EASTERN FAÇADE

$$10.92 \times 5.65 \times 0.257 = 15.86$$

SOUTHERN FAÇADE

$$10.39 \times 5.65 \times 0.257 = 15.09$$

WESTERN FAÇADE

$$3.19 \times 5.65 \times 0.257 = 4.63$$

$$6.15 \times 5.65 \times 0.257 = 8.93$$

NORTHERN FAÇADE

$$W1: 1.62[0.81(-0.06 \times 1.00 + 1.46 \times 1.00) + -0.02 \times 7.90] = 1.58$$

$$W1: 1.62[0.81(-0.06 \times 1.00 + 1.46 \times 1.00) + -0.02 \times 7.90] = 1.58$$

$$W2: 0.81[0.81(-0.06 \times 1.00 + 1.46 \times 1.00) + -0.02 \times 7.90] = 0.79$$

$$W3: 1.62[0.81(-0.06 \times 1.00 + 1.46 \times 1.00) + -0.02 \times 7.90] = 1.58$$

Total for sector N is 5.50 and max allowed is 15.09 → FAÇADE Passes

EASTERN FAÇADE

$$W4: 3.60[0.81(-0.18 \times 1.00 + 1.32 \times 1.00) + 0.00 \times 7.90] = 3.32$$

$$W9: 6.00[0.66(-0.18 \times 0.02 + 1.32 \times 0.30) + 0.00 \times 3.40] = 1.55$$

$$W5: 3.60[0.66(-0.18 \times 1.00 + 1.32 \times 1.00) + 0.00 \times 3.40] = 2.71$$

$$W9: 5.04[0.66(-0.18 \times 0.02 + 1.32 \times 0.30) + 0.00 \times 3.40] = 1.31$$

Total for sector E is 8.89 and max allowed is 13.64 → FAÇADE Passes

SOUTHERN FAÇADE

$$W4: \quad 3.60[0.81(-0.47 \times 1.00 + 0.41 \times 1.00) + 0.07 \times 7.90] = 1.82$$

$$W9: \quad 6.00[0.66(-0.47 \times 0.67 + 0.41 \times 0.57) + 0.07 \times 3.40] = 1.11$$

$$W5: \quad 3.60[0.66(-0.47 \times 1.00 + 0.41 \times 1.00) + 0.07 \times 3.40] = 0.71$$

$$W9: \quad 5.04[0.66(-0.47 \times 0.67 + 0.41 \times 0.57) + 0.07 \times 3.40] = 0.93$$

Total for sector S is 4.57 and max allowed is 15.09 → FAÇADE Passes

WESTERN FAÇADE 1

$$W8: 1.80[0.66(-0.28 \times 0.08 + 1.13 \times 0.31) + 0.02 \times 3.40] = 0.51$$

$$W8: 3.78[0.66(-0.28 \times 0.08 + 1.13 \times 0.31) + 0.02 \times 3.40] = 1.08$$

Total for sector W1 is 1.59 and max allowed is 4.63 → FAÇADE Passes

WESTERN FAÇADE 2

$$W6: 1.08[0.81(-0.28 \times 1.00 + 1.13 \times 1.00) + 0.02 \times 7.90] = 0.91$$

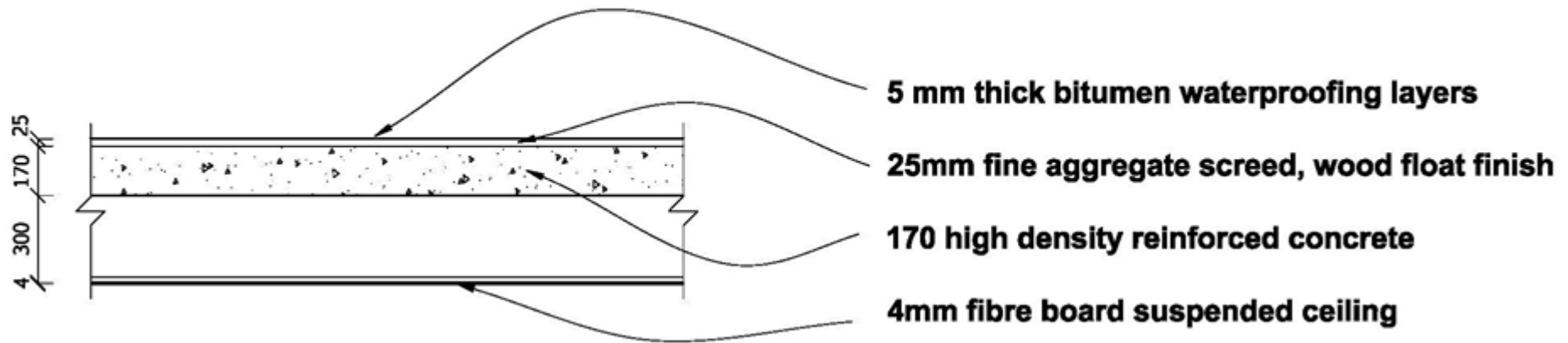
$$W7: 1.08[0.81(-0.28 \times 1.00 + 1.13 \times 1.00) + 0.02 \times 7.90] = 0.91$$

$$D1: 5.04[0.81(-0.28 \times 1.00 + 1.13 \times 1.00) + 0.02 \times 7.90] = 4.27$$

Total for sector W2 is 6.09 and max allowed is 8.93 → FAÇADE Passes

Building is suitable for Aircon / Mechanical ventilation

EXAMPLE : (ZONE 2)



Air film (top)

R-value = 0.03 (Table F2 – SANS204)

Bitumen:

$$\text{R-value} = \frac{\text{Thickness of Material}}{\text{Thermal Conductivity}} = \frac{0.005}{0.5} = 0.01$$

Screed:

$$\text{R-value} = \frac{\text{Thickness of Material}}{\text{Thermal Conductivity}} = \frac{0.025}{0.28} = 0.09$$

EXAMPLE : (ZONE 2)

Concrete:

$$\text{R-value} = \frac{\text{Thickness of Material}}{\text{Thermal Conductivity}} = \frac{0.170}{1.40} = 0.12$$

300mm Air:

R-value = 0.15 (Table F2 – SANS204)

Ceiling:

R-value = 0.06 (Table F3 – SANS204)

Air film (Beneath ceiling)

R-value = 0.11 (Table F2 – SANS204)

$$\text{Total} = 0.03 + 0.01 + 0.09 + 0.12 + 0.02 + 0.15 + 0.06 + 0.11 = 0.59$$

$$3.2 - 0.59 = 2.61$$

$$2.61 \times 0.040 = 0.104\text{m} = 104\text{mm Flexible Glass Fibre Blanket}$$

EXAMPLE : (ZONE 2)

MASONRY:

Outdoor air film = 0.03 (Table F2)

Plaster (16mm) = $\frac{\text{Thickness of Material}}{\text{Thermal Conductivity}} = \frac{0.016}{0.28} = 0.06$

Outer leave = $\frac{\text{Thickness of Material}}{\text{Thermal Conductivity}} = \frac{0.115}{0.77} = 0.15$

Inner leave = $\frac{\text{Thickness of Material}}{\text{Thermal Conductivity}} = \frac{0.115}{0.56} = 0.21$

Plaster (16mm) = $\frac{\text{Thickness of Material}}{\text{Thermal Conductivity}} = \frac{0.016}{0.28} = 0.06$

Indoor air film = 0.16 (Table F2)

Total = 0.03 + 0.06 + 0.15 + 0.21 + 0.06 + 0.16 = 0.67 (>0.35)

Cavity wall + 0.67 + 0.16 = 0.83 (>0.35)

HOT WATER STORAGE CAPACITY

A20 Classification:	H4
A21 Occupancy:	2 persons/bedroom
Type of hot water generation:	Solar with back-up element
Hot water demand (SANS10252-1):	140 liter per day per person
Number of Bedrooms:	3
Total demand:	$3 \times 2 \times 140 = 840$ liter
Hot water storage capacity required:	$840 \times 50\% = 420$ liter
Capacity to be provided:	450 liter