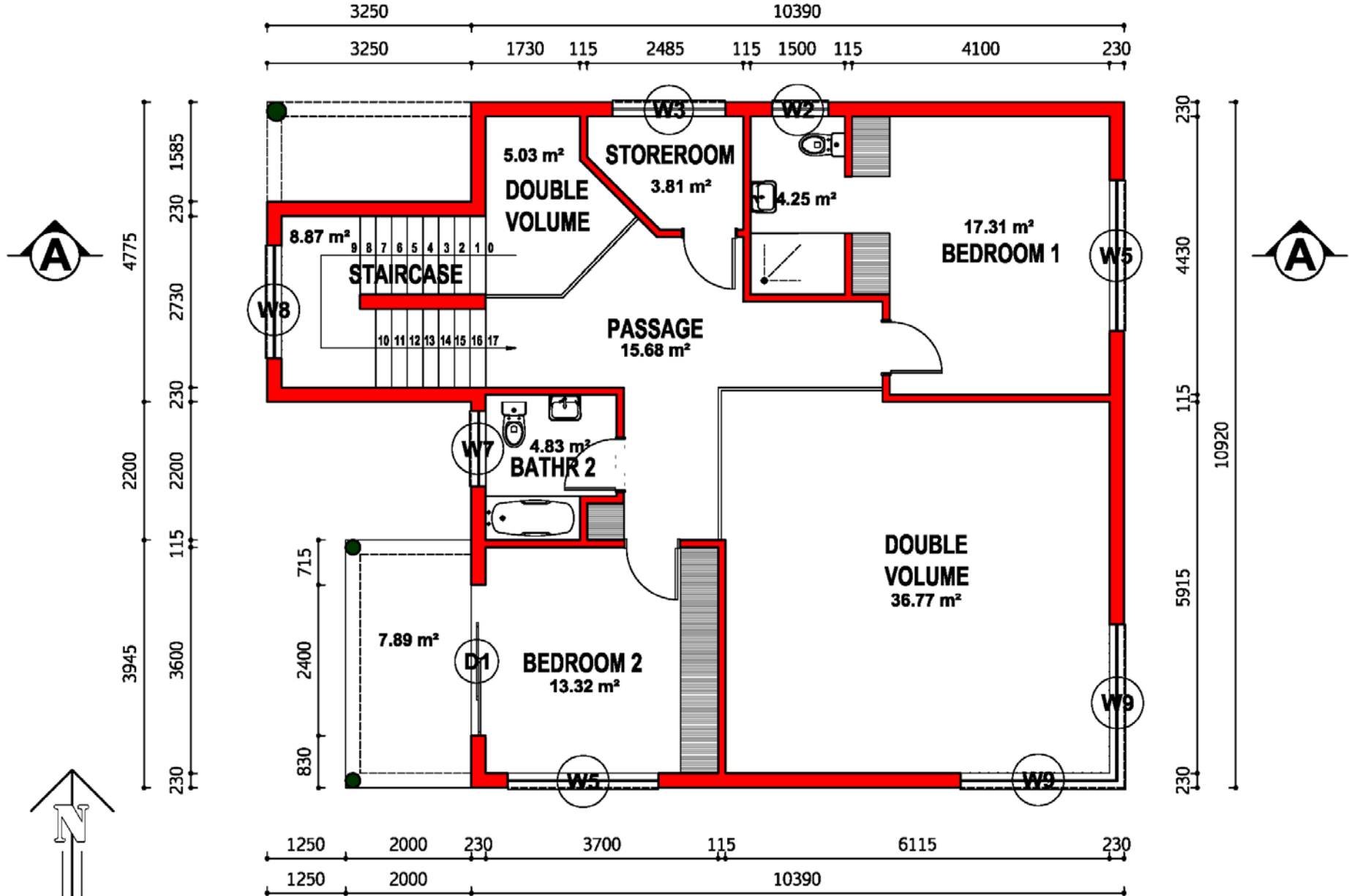


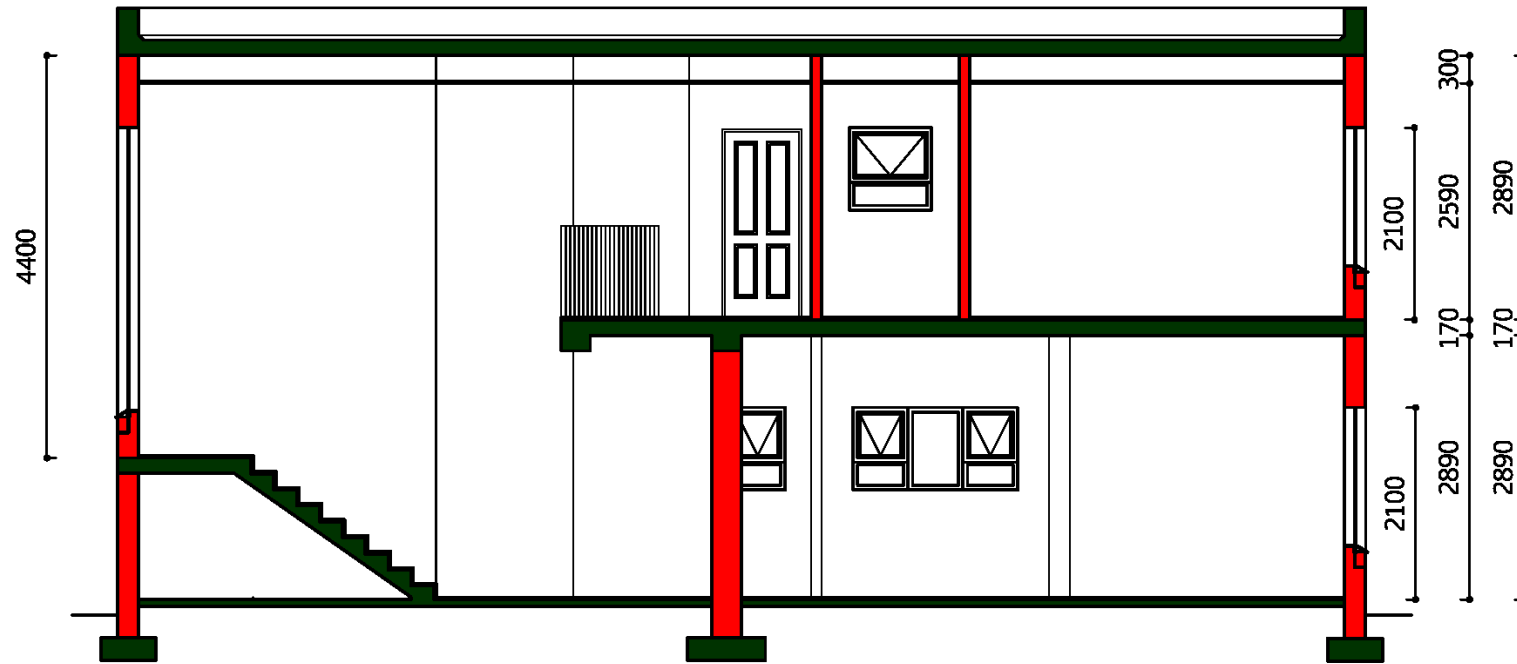
**GROUND STOREY LAYOUT**  
**Scale 1: 75**

CALCULATIONS FOR ZONE 5



**FIRST STOREY LAYOUT**  
**Scale 1: 75**

CALCULATIONS FOR ZONE 5



**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 <sup>2</sup> ) | Opening: 5.04<br>Glass: 5.04  | Opening: 1.62<br>Glass: 1.62                                   | Opening: 0.81<br>Glass: 0.81                                   | Opening: 1.62<br>Glass: 1.62                                   | Opening: 3.60<br>Glass: 3.60                                   |
| FRAME                  | Clear aluminium for 2400 × 2100 opening   | PTT1809<br>Coated aluminium                                    | PT0909<br>Coated aluminium                                     | PT1809<br>Coated aluminium                                     | PTT2415<br>Coated aluminium                                    |
| GLASS                  | Clear laminated safety glass<br>Fixed to panels with beading and seals provided | Clear glass<br>Fixed to panels with beading and seals provided | Clear glass<br>Fixed to panels with beading and seals provided | Clear glass<br>Fixed to panels with beading and seals provided | Clear glass<br>Fixed to panels with beading and seals provided |
| VALUE                  | U: 7.9<br>SHGC: 0.81  | U: 7.9<br>SHGC: 0.81   | U: 7.9<br>SHGC: 0.81   | U: 7.9<br>SHGC: 0.81   | U: 7.9<br>SHGC: 0.81   |

# WINDOW SCHEDULE

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

## NATURAL VENTILATION

### GROUND STOREY

Nett floor area: 114.99

Fenestration area: 26.82

Window to floor area ratio for Ground Storey is 23.32 %

### CONSTANTS

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

SHG Constant for Ground Storey is  $114.99 \times 0.11 = 12.65$

## 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 Tinted 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)

$$1.62 \times 0.81 \times 0.41 = 0.54$$

$$0.54 \times 2 = 1.08$$

EAST

Solar heat gain of Window 4

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

$$3.60 \times 0.81 \times 1.19 = 3.47$$

Solar heat gain of Window 9

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

$$6.00 \times 0.54 \times 0.28 = 0.91$$

## SOUTH

Solar heat gain of Window 4

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

$$3.60 \times 0.81 \times 0.75 = 2.19$$

Solar heat gain of Window 9

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

$$6.00 \times 0.54 \times 0.29 = 0.94$$

## WEST

Solar heat gain of Window 6

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

$$1.08 \times 0.81 \times 1.15 = 1.01$$

Solar heat gain of Window 8

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

$$1.80 \times 0.54 \times 0.34 = 0.33$$

Total Solar Heat Gain for Ground Storey:

$$1.08 + 3.47 + 0.91 + 2.19 + 0.94 + 1.01 + 0.33 = 9.93 (<12.65)$$

Solar Heat Gain for Ground Storey PASS!

## FIRST STOREY

Nett floor area: 109.87

Fenestration area: 29.61

Window to floor area ratio for Ground Storey is 26.95 %

## CONSTANTS

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

SHG Constant for First Storey is  $109.87 \times 0.11 = 12.09$

## 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

Change Glass of D1 to Tinted 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  $5.04 \times 3.40 = 17.14$

Conductance of Window 7 is  $1.08 \times 7.9 = 8.53$

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

Total Conductance for First Storey is 116.48 (<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

$$1.62 \times 0.81 \times 0.41 = 0.54$$

Solar heat gain of Window 2

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

$$0.81 \times 0.81 \times 0.41 = 0.27$$



## EAST

Solar heat gain of Window 5

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

$$3.60 \times 0.54 \times 1.19 = 2.31$$

Solar heat gain of Window 9

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

$$5.04 \times 0.54 \times 0.28 = 0.76$$

## SOUTH

Solar heat gain of Window 9

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

$$5.04 \times 0.54 \times 0.18 = 0.49$$

Solar heat gain of Window 5

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

$$3.60 \times 0.54 \times 0.75 = 1.46$$

## WEST

Solar heat gain of Door 1

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

$$5.04 \times 0.54 \times 1.15 = 3.13$$

Solar heat gain of Window 7

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

$$1.08 \times 0.81 \times 1.15 = 1.01$$

Solar heat gain of Window 8

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

$$3.78 \times 0.54 \times 0.34 = 0.69$$

Total Solar Heat Gain for First Storey:

$$0.54 + 0.27 + 2.31 + 0.76 + 0.49 + 1.46 + 3.13 + 1.01 + 0.69 = 10.66 (<12.09)$$

Solar Heat Gain for First Storey PASS!

## ARTIFICIAL VENTILATION

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

## ENERGY INDEX

### NORTHERN FAÇADE

$$10.39 \times 5.65 \times 0.180 = 10.57$$

### EASTERN FAÇADE

$$10.92 \times 5.65 \times 0.180 = 11.11$$

## SOUTHERN FAÇADE

$$10.39 \times 5.65 \times 0.180 = 10.57$$

## WESTERN FAÇADE

$$3.19 \times 5.65 \times 0.180 = 3.24$$

$$6.15 \times 5.65 \times 0.180 = 6.25$$

## NORTHERN FAÇADE

$$W1: 1.62[0.81(0.00 \times 1.00 + 0.80 \times 1.00) + 0.02 \times 7.90] = 1.31$$

$$W1: 1.62[0.81(0.00 \times 1.00 + 0.80 \times 1.00) + 0.02 \times 7.90] = 1.31$$

$$W2: 0.81[0.81(0.00 \times 1.00 + 0.80 \times 1.00) + 0.02 \times 7.90] = 0.65$$

$$W3: 1.62[0.81(0.00 \times 1.00 + 0.80 \times 1.00) + 0.02 \times 7.90] = 1.31$$

Total for sector N is 4.58 and max allowed is 10.57 → FAÇADE Passes

## EASTERN FAÇADE

$$W4: \quad 3.60[0.81(0.00 \times 1.00 + 0.91 \times 1.00) + 0.02 \times 7.90] = 3.22$$

$$W9: \quad 6.00[0.54(0.00 \times 1.00 + 0.91 \times 0.26) + 0.02 \times 3.40] = 1.71$$

$$W5: \quad 3.60[0.54(0.00 \times 1.00 + 0.91 \times 1.00) + 0.02 \times 3.40] = 2.34$$

$$W9: \quad 5.04[0.54(0.00 \times 1.00 + 0.91 \times 0.26) + 0.02 \times 3.40] = 1.44$$

Total for sector E is 8.71 and max allowed is 11.11 → FAÇADE Passes



## SOUTHERN FAÇADE

$$W4: \quad 3.60[0.81(0.00 \times 1.00 + 0.48 \times 1.00) + 0.02 \times 7.90] = 1.97$$

$$W9: \quad 6.00[0.54(0.00 \times 1.00 + 0.48 \times 0.52) + 0.02 \times 3.40] = 1.22$$

$$W5: \quad 3.60[0.54(0.00 \times 1.00 + 0.48 \times 1.00) + 0.02 \times 3.40] = 1.18$$

$$W9: \quad 5.04[0.54(0.00 \times 0.67 + 0.48 \times 0.52) + 0.02 \times 3.40] = 1.02$$

Total for sector S is 5.39 and max allowed is 10.57 → FAÇADE Passes

## WESTERN FAÇADE 1

$$W8: 1.80[0.54(0.00 \times 1.00 + 0.88 \times 0.29) + 0.02 \times 3.40] = 0.37$$

$$W8: 3.78[0.54(0.00 \times 1.00 + 0.88 \times 0.29) + 0.02 \times 3.40] = .078$$

Total for sector W1 is 1.15 and max allowed is 3.24 → FAÇADE Passes

## WESTERN FAÇADE 2

$$W6: 1.08[0.81(0.00 \times 1.00 + 0.88 \times 1.00) + 0.02 \times 7.90] = 0.94$$

$$W7: 1.08[0.59(0.00 \times 1.00 + 0.88 \times 1.00) + 0.02 \times 4.23] = 0.94$$

$$D1: 5.04[0.54(0.00 \times 1.00 + 0.88 \times 1.00) + 0.02 \times 3.40] = 2.74$$

Total for sector W2 is 4.62 and max allowed is 6.25 → FAÇADE Passes

Building is suitable for Aircon / Mechanical ventilation

## 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                           |