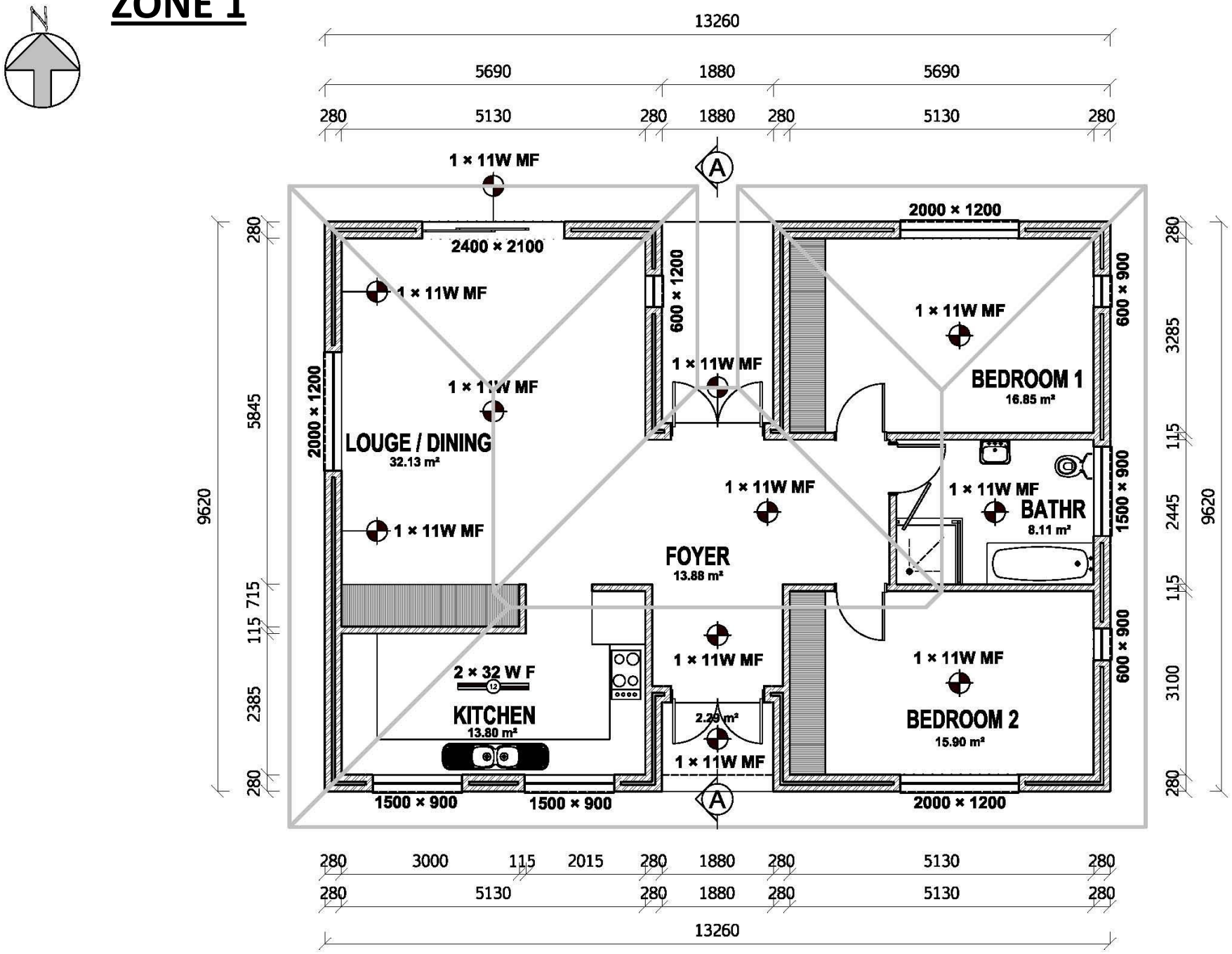
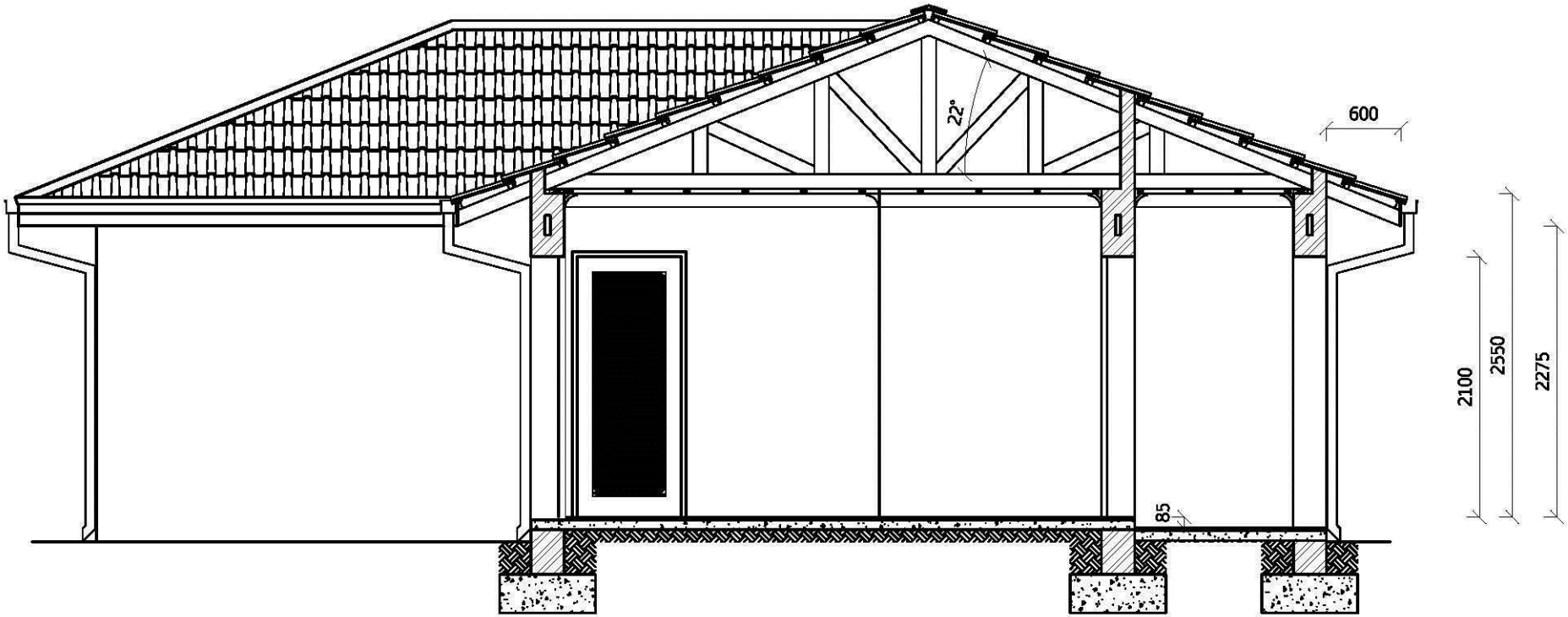
ZONE 1


N
13260
5690
1880
5690
280
5130
280
1880
280
5130
280
1 × 11W MF
A
2400 × 2100
2000 × 1200
600 × 1200
600 × 900
1 × 11W MF
1 × 11W MF
1 × 11W MF
BEDROOM 1
16.85 m²
2000 × 1200
LOUGE / DINING
32.13 m²
1 × 11W MF
1 × 11W MF
1 × 11W MF
BATHR
8.11 m²
1500 × 900
1 × 11W MF
FOYER
13.88 m²
2 × 32 W F
1 × 11W MF
1 × 11W MF
KITCHEN
13.80 m²
2.29 m²
BEDROOM 2
15.90 m²
1 × 11W MF
600 × 900
1500 × 900
1500 × 900
2000 × 1200
A
280
5845
715
115
2385
280
9620
280
3285
115
2445
115
3100
280
9620
280
3000
115
2015
280
1880
280
5130
280
280
5130
280
1880
280
5130
280
13260


22°
600
2100
2550
2275
85

NATURAL VENTILATION

CONSTANTS:

CONDUCTANCE: $100.67 \times 1.2 = 120.80$
SHG: $100.67 \times 0.15 = 15.10$

CONDUCTANCE:

Use clear glass in aluminium split frame

$A \times U = 18.09 \times 5.6$
$= 101.30$ (< 120.80 √)

SOLAR HEAT GAIN:

$P = 600 + 115 = 715$
$G = 2275 - 2100 = 175$ (<500)

2100 Door: P/H = 715/2275 = 0.31
1200 Window: P/H = 715/1375 = 0.52
900 Window: P/H = 715/1075 = 0.66

NORTH:

$5.04 \times 0.77 \times 0.44 = 1.71$
$2.40 \times 0.77 \times 0.33 = 0.61$

EAST:

$(0.54 \times 0.77 \times 0.61) \times 2 = 0.51$
$1.35 \times 0.77 \times 0.61 = 0.63$
$0.72 \times 0.77 \times 0.66 = 0.37$

SOUTH:

$2.40 \times 0.77 \times 0.33$	$= 0.61$
$(1.35 \times 0.77 \times 0.31) \times 2$	$= 0.64$

WEST:

$2.40 \times 0.77 \times 0.83$	$= 1.53$

TOTAL **= 6.61 (<15.10)**

ARTIFICIAL VENTILATION:

ENERGY INDEX:

NORTHERN FAÇADE:		13.26 × 2.550	= 33.81
		33.81 × 0.22	= 7.44
EASTERN FAÇADE:	F1	3.4 × 2.550	= 8.67
		8.67 × 0.22	= 1.91
	F2:	9.62 × 2.550	= 24.53
		24.53 × 0.22	= 5.40
SOUTHERN FAÇADE:		13.26 × 2.550	= 33.81
		33.81 × 0.22	= 7.44
WESTERN FAÇADE:		9.62 × 2.550	= 24.53
		24.53 × 0.22	= 5.40

NORTHERN FAÇADE:

$A[S(C_A \times S_H + C_B \times S_C) + C_C \times U]$ $= 5.04[0.77(-0.37 \times 0.99 + 1.53 \times 0.93) +-0.01 \times 5.6]$

$= 5.04[0.77\ (-0.37 + 1.42)\ -0.06]$

$= 5.04[0.77(1.05) – 0.06]$

$= 5.04[0.81 – 0.06]$

$= 5.04 \times 0.75$

$= 3.78$

$A[S(C_A \times S_H + C_B \times S_C) + C_C \times U]$ $= 2.4[0.77(-0.37 \times 0.96 + 1.53 \times 0.79) +- 0.01 \times 5.6]$

$= 2.4[0.77(-0.36 + 1.21) – 0.06$

$= 2.4[0.77(0.85) – 0.06]$

$= 2.4(0.65\ \ - 0.06]$

$= 2.4 \times 0.59$

$= 1.42$

$3.78 + 1.42 = 5.20\ (<7.44\ \surd)$

EASTERN FAÇADE:

F1

$A[S(C_A \times S_H + C_B \times S_C) + C_C \times U]$ $= 0.72[0.77(-0.59 \times 0.86 + 1.39 \times 0.85) + 0.03 \times 5.6]$

$= 1.35[0.77(-0.51 + 1.18) + 0.17]$

$= 1.35[0.77(0.67) + 0.17]$

$= 1.35(0.52 + 0.17)$

$= 1.35 \times 0.69$

$= 0.93$ (<1.91 √)

F2

$A[S(C_A \times S_H + C_B \times S_C) + C_C \times U]$ $= 1.35[0.77(-0.59 \times 0.83 + 1.39 \times 0.75) + 0.03 \times 5.6]$

$= 1.35[0.77(-0.49 + 1.04) + 0.17]$

$= 1.35[0.77(0.55) + 0.17]$

$= 1.35(0.42 + 0.17)$

$= 1.35 \times 0.59$

$= 0.80$

$A[S(C_A \times S_H + C_B \times S_C) + C_C \times U]$ $= 0.54[0.77(-0.59 \times 0.83 + 1.39 \times 0.75) + 0.03 \times 5.6]$

$= 0.54[0.77(-0.49 + 1.04) + 0.17]$

$= 0.54[0.77(0.55) + 0.17]$

$= 0.54(0.42 + 0.11)$

$= 0.54 \times 0.59$

$= 0.32$

2 Windows $= 0.32 \times 2 = 0.64$

$0.80 + 0.64 = 1.44$ $(<5.40 \surd)$

SOUTHERN FAÇADE:

$A[S(C_A \times S_H + C_B \times S_C) + C_C \times U]$ $= 2.4[0.77(-0.87 \times 0.88 + 0.38 \times 0.84) + 0.15 \times 5.6]$

$= 2.4[0.77(-0.77 + 0.32) + 0.84]$

$= 2.4[0.77(-0.45) + 0.84]$

$= 2.4(-0.35 + 0.84)$

$= 2.4 \times 0.49$

$= 1.18$

$A[S(C_A \times S_H + C_B \times S_C) + C_C \times U]$ $= 1.35[0.77(-0.87 \times 0.87 + 0.38 \times 0.81) + 0.15 \times 5.6]$

$= 1.35[0.77(-0.76 + 0.31) + 0.84]$

$= 1.35[0.77(-0.24) + 0.84]$

$= 1.35(-0.18 + 0.84)$

$= 1.35 \times 0.66$

$= 0.89$

2 Windows $= 0.89 \times 2 = 1.78$

$1.18 + 1.78 = 2.96 (<7.44 \surd)$

WESTERN FAÇADE:

$A[S(C_A \times S_H + C_B \times S_C) + C_C \times U]$ $= 2.4[0.77(-0.85 \times 0.91 + 1.07 \times 0.85) + 0.08 \times 5.6]$

$= 2.4[0.77(-0.77 + 0.91) + 0.45]$

$= 2.4[0.77(0.14) + 0.45]$

$= 2.4(0.11 + 0.45)$

$= 2.4 \times 0.56$

$= 1.34$ (<5.40 √)

BUILDING SUITABLE FOR AIRCONDITIONING / MECHANICAL VENTILATION

LIGHTING

ENERGY DEMAND:

ALLOWED: $5W/m^2$

$5W/m^2 \times 121.92m^2 = 609.60W$

$11 \times 11W$ lamps + $2 \times 32W$ lamps = $185W$ ($< 609.60W$ √)

or

$185W / 121.92m^2 = 1.52W/m^2$ ($<5W/m^2$)

ENERGY CONSUMPTION:

ALLOWED: 5kWh/m².a or 5kWh/m² [a = 1 (year)]

5kWh/m².a × 121.92m² = 609.60kWh.a

Assume lights are on from 17:00 – 22:00 each day/year
That is 5h/day

52 (weeks) × 7 (days) × 5 (h) = 1 820h.a

There are 11 x 11W lamps, 2 x 32W lamps = (11 × 11W) + (2 × 32W)
= 121W + 64W
= 185W
= 0.185kW

0.185kW × 1 820h.a = 336.7kWh.a (< 609.60kWh.a √)