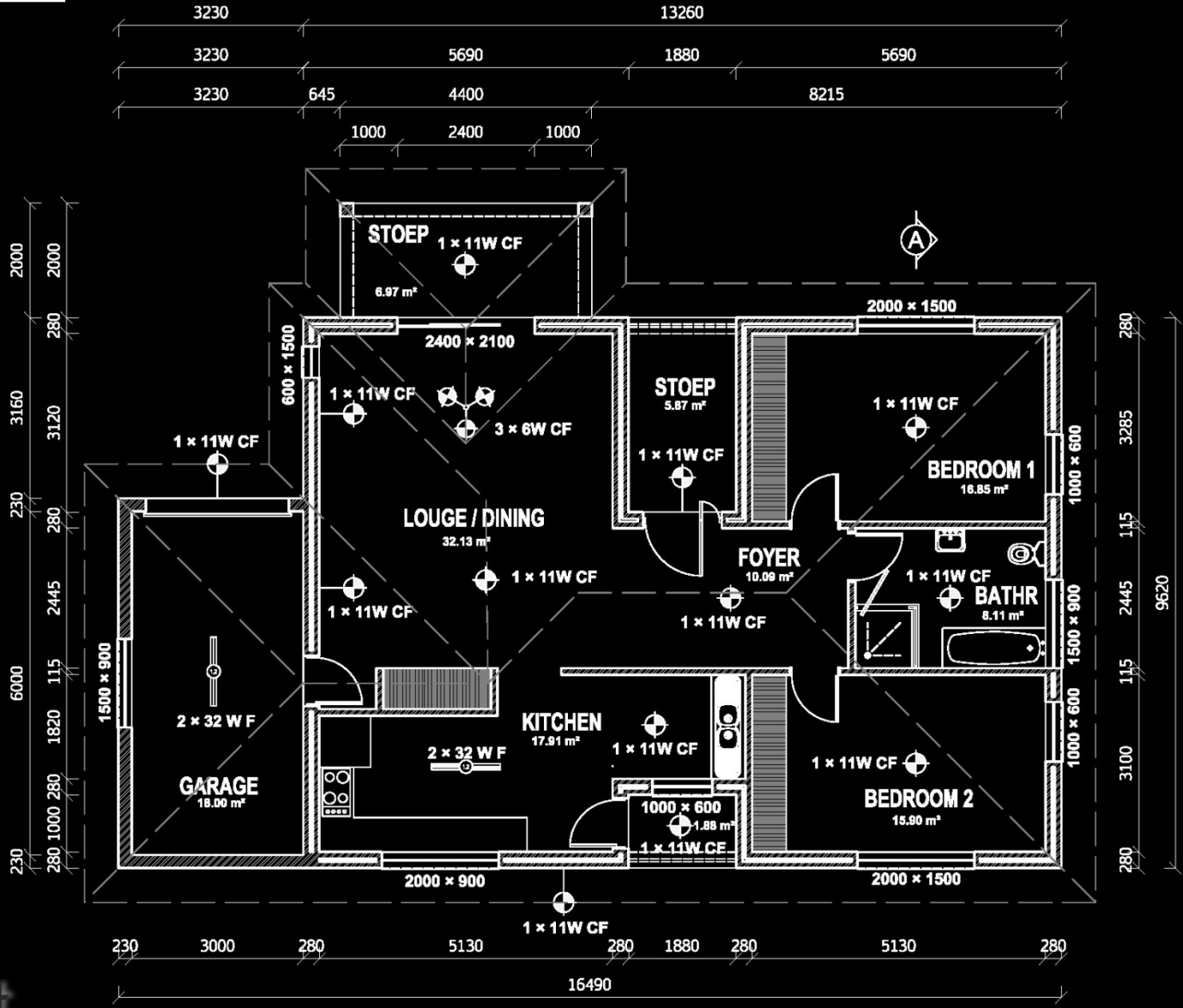


ZONE 4



Conductance: A x U

 SHG: A x S x E



NATURAL VENTILATION

CHECK FOR COMPLIANCE WITH 10400XA

NET FLOOR AREA: 100.99m²

GLAZING AREA:

$$2.4 \times 2.1 = 5.04$$

$$2 \times 1.5 \times 2 = 6.00$$

$$0.6 \times 1.0 \times 3 = 1.80$$

$$1.5 \times 0.9 = 1.35$$

$$2.0 \times 0.9 = 1.80$$

$$0.6 \times 1.5 = \underline{0.90}$$

16.89

$$16.89/100.99 \times 100 = 16.72\%$$

Do not comply with max of 15% as per SANS10400XA



NATURAL VENTILATION

CONSTANTS:

$$\text{CONDUCTANCE:} \quad 100.99 \times 1.4 = 141.39$$

$$\text{SHG:} \quad 100.99 \times 0.13 = 13.13$$

CONDUCTANCE:

Use clear glass in wooden frame

$$\begin{aligned} A \times U &= 16.89 \times 5.6 \\ &= 94.58 \quad (< 141.39 \checkmark) \end{aligned}$$

SOLAR HEAT GAIN:

$$P_1 = 600 + 115 = 715, \quad P_2 = 600 + 115 + 1280 = 1995;$$

$$P_3 = 1000 + 600 = 1600$$

$$G = 2270 - 2100 = 170 (< 500)$$



2100 Door:	$P/H = 1600/2270 = 0.70$
1500 Window:	$P/H = 715/1670 = 0.43$
900 Window:	$P/H = 715/1070 = 0.67$
600 Window ₁ :	$P/H = 715/770 = 0.93$
600 Window ₂ :	$P/H = 1995/770 = 2.59$

NORTH:

$$5.04 \times 0.77 \times 0.28 = 1.09$$

$$3.00 \times 0.77 \times 0.36 = 0.83$$

EAST:

$$(0.60 \times 0.77 \times 0.46) \times 2 = 0.43$$

$$1.35 \times 0.77 \times 0.61 = 0.63$$

SOUTH:

$$3.00 \times 0.77 \times 0.36 = 0.83$$

$$1.80 \times 0.77 \times 0.31 = 0.43$$

$$0.60 \times 0.77 \times 0.17 = 0.08$$

WEST:

$$0.90 \times 0.77 \times 0.90 = \underline{0.62}$$

$$\text{TOTAL} = 4.94 (<13.13)$$

$$A_1 [S_1 (C_A \times S_{H1} + C_B \times S_{C1}) + C_C \times U_1]$$

$A_{1,2,3}$ is the area of each glazing element

$C_{A,B,C}$ are the energy constants in table D1

$S_{1,2,3}$ is the SHGC of each glazing element in Table 6

$S_{H1,H2,H3}$ is the heating shading multiplier for each value element given in table D2

$S_{C1,C2,C3}$ is the cooling shading multiplier for each value element given in table D3

$U_{1,2,3}$ is the total U-value of each glazing element given in table 6

2100 Door: $P/H = 1600/2270 = 0.70$

1500 Window: $P/H = 715/1670 = 0.43$

900 Window: $P/H = 715/1070 = 0.67$

600 Window₁: $P/H = 715/770 = 0.93$

600 Window₂: $P/H = 1995/770 = 2.59$

$$G = 2270 - 2100 = 170 (<500)$$



ARTIFICIAL VENTILATION:

ENERGY INDEX:

NORTHERN FAÇADE: $13.26 \times 2.550 = 33.81$

$$33.81 \times 0.220 = 7.44$$

EASTERN FAÇADE: $9.62 \times 2.550 = 24.53$

$$24.53 \times 0.220 = 5.40$$

SOUTHERN FAÇADE: $13.26 \times 2.550 = 33.81$

$$33.81 \times 0.220 = 7.44$$

WESTERN FAÇADE: $9.62 \times 2.550 = 24.53$

$$24.53 \times 0.220 = 5.40$$

NORTHERN FAÇADE:

$$\begin{aligned} A[S(C_A \times S_H + C_B \times S_C) + C_C \times U] &= 5.04[0.77(-0.37 \times 0.88 + 1.53 \times 0.64) + -0.01 \times 5.6] \\ &= 5.04[0.77(-0.33 + 0.98) -0.06] \\ &= 5.04[0.77(0.65) -0.06] \\ &= 5.04[0.50 - 0.06] \\ &= 5.04 \times 0.44 \\ &= 2.22 \end{aligned}$$

$$\begin{aligned} A[S(C_A \times S_H + C_B \times S_C) + C_C \times U] &= 3[0.77(-0.37 \times 0.96 + 1.53 \times 0.79) + -0.01 \times 5.6] \\ &= 3[0.77(-0.36 + 1.21) -0.06] \\ &= 3[0.77(0.85) -0.06] \\ &= 3[0.65 -0.06] \\ &= 3 \times 0.59 \\ &= 1.77 \end{aligned}$$

$$2.22 + 1.77 = 3.99 (<7.44 \checkmark)$$



EASTERN FAÇADE:

$$\begin{aligned} A[S(C_A \times S_H + C_B \times S_C) + C_C \times U] &= 1.35[0.77(-0.59 \times 0.83 + 1.39 \times 0.75) + 0.03 \times 5.6] \\ &= 1.35[0.77(-0.49 + 1.04) + 0.17] \\ &= 1.35[0.77(0.55) + 0.17] \\ &= 1.35(0.42 + 0.17) \\ &= 1.35 \times 0.59 \\ &= 0.80 \end{aligned}$$

$$\begin{aligned} A[S(C_A \times S_H + C_B \times S_C) + C_C \times U] &= 0.6[0.77(-0.59 \times 0.73 + 1.39 \times 0.65) + 0.03 \times 5.6] \\ &= 0.6[0.77(-0.43 + 0.90) + 0.17] \\ &= 0.6[0.77(0.47) + 0.17] \\ &= 0.6(0.36 + 0.17) \\ &= 0.6 \times 0.53 \\ &= 0.32 \end{aligned}$$

$$2 \text{ Windows} = 0.32 \times 2 = 0.64$$

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

SOUTHERN FAÇADE:

$$\begin{aligned} A[S(C_A \times S_H + C_B \times S_C) + C_C \times U] &= 3[0.77(-0.87 \times 0.93 + 0.38 \times 0.88) + 0.15 \times 5.6] \\ &= 3[0.77(-0.81 + 0.33) + 0.84] \\ &= 3[0.77(-0.27) + 0.84] \\ &= 3(-0.21 + 0.84) \\ &= 3 \times 0.63 \\ &= 1.89 \end{aligned}$$

$$\begin{aligned} A[S(C_A \times S_H + C_B \times S_C) + C_C \times U] &= 1.8[0.77(-0.87 \times 0.87 + 0.38 \times 0.81) + 0.15 \times 5.6] \\ &= 1.8[0.77(-0.76 + 0.31) + 0.84] \\ &= 1.8[0.77(-0.45) + 0.84] \\ &= 1.8(-0.35 + 0.84) \\ &= 1.8 \times 0.49 \\ &= 0.88 \end{aligned}$$

$$\begin{aligned} A[S(C_A \times S_H + C_B \times S_C) + C_C \times U] &= 0.6[0.77(-0.87 \times 0.64 + 0.38 \times 0.60) + 0.15 \times 5.6] \\ &= 0.6[0.77(-0.56 + 0.23) + 0.84] \\ &= 0.6[0.77(-0.33) + 0.84] \\ &= 0.6(-0.25 + 0.84) \\ &= 0.6 \times 0.59 \\ &= 0.35 \end{aligned}$$

$$1.89 + 0.88 + 0.35 = 3.12 (<7.44 \checkmark)$$

WESTERN FAÇADE:

$$\begin{aligned} A[S(C_A \times S_H + C_B \times S_C) + C_C \times U] &= 0.9[0.77(-0.85 \times 0.91 + 1.07 \times 0.85) + 0.08 \times 5.6] \\ &= 0.9[0.77(-0.77 + 0.91) + 0.45] \\ &= 0.9[0.77(-0.14) + 0.45] \\ &= 0.9(-0.11 + 0.45) \\ &= 0.9 \times 0.34 \\ &= 0.31 (<5.40 \checkmark) \end{aligned}$$

BUILDING SUITABLE FOR AIRCONDITIONING / MECHANICAL VENTILATION