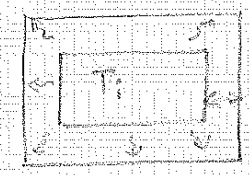
Qatanis 1 body materials:
- main: PU, $\lambda = 0.023$ W/mK, filling
- structural: XPS, $\lambda = 0.034$ W/mK, e.g. 30mm thick

2D:

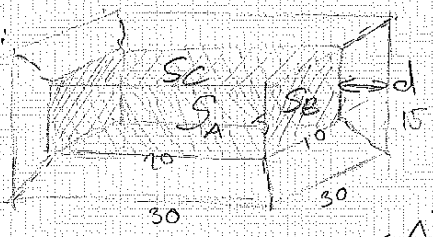


$T_e \in]-80, -28[$ °C

$T_i \in]-20, \rightarrow[$ °C

S: total inner surface

3D:



$$\frac{\Delta Q}{\Delta t} = \frac{\lambda S}{d} (T_i - T_e)$$ ← ΔT

d: due to the rectangular nature of the inner box, there are 2 values for d: 10cm and 5cm, I use the average: 7.5cm

Scenario ①:

$\lambda = 0.023$ W/mK // Vol. for PU, ignoring XPS. → be WARNED

$\Delta t = 24$h

$(T_i - T_e) = 40$K

$S_A = 50\text{mm} \times 200\text{mm} = 10000\text{mm}^2$

$S_B = 50\text{mm} \times 100\text{mm} = 5000\text{mm}^2$

$S_C = 100\text{mm} \times 200\text{mm} = 20000\text{mm}^2$

$S = 35000\text{mm}^2 = 0.035\text{m}^2$

$$\Delta Q = \frac{\lambda \cdot S}{d} \cdot \Delta t \cdot \Delta T = \frac{0.023\text{ W} \cdot 0.035\text{m}^2 \cdot 24\text{h}}{\text{m·K} \cdot 0.075\text{m}} \cdot \Delta$$

$$= \frac{0.2576\text{ Wh} \cdot 40\text{K}}{\text{K}} = 10.3\text{ Wh}$$

Scenario ②:

changing: $S_C = 100\text{mm} \times 100\text{mm} = 10000\text{mm}^2$ ⇒ $S = 0.025\text{m}^2$

⇒ $\Delta Q = 7.36$ Wh

Scenario ③ inherits ②:

changing $\Delta T = 20$K ⇒ 3.68 Wh