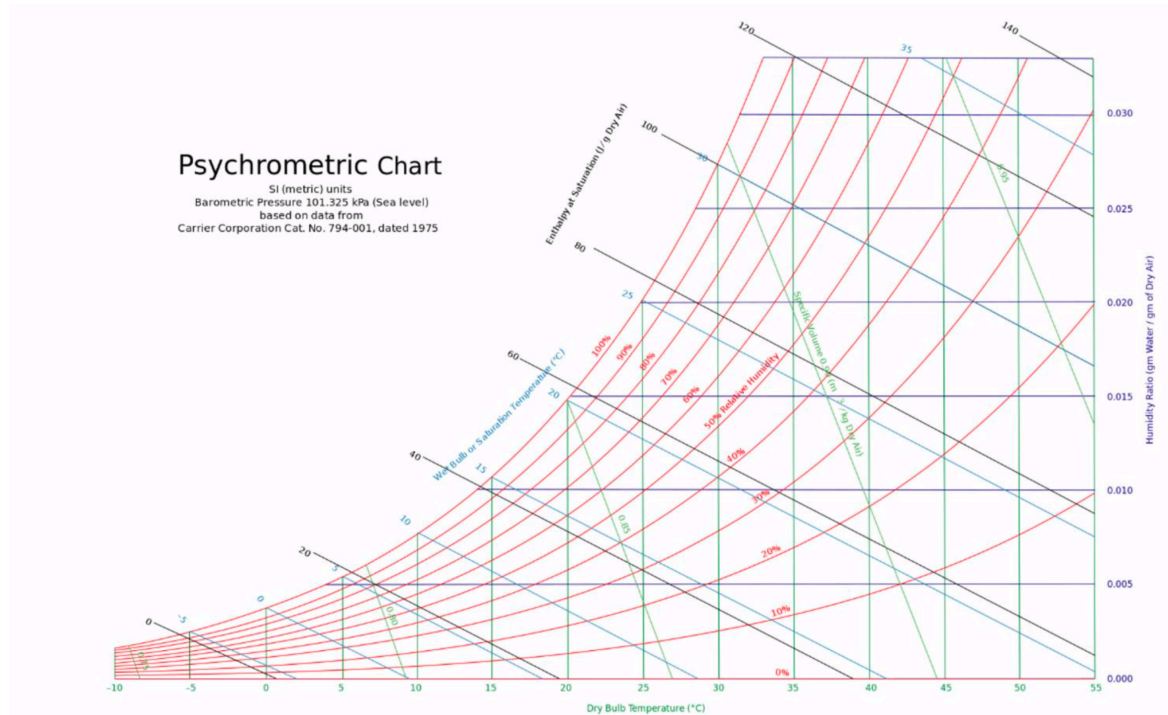# Week 9

Task 1

Relative humidity = 86%
Atmospheric pressure = 1028 Pa
Total air pressure = 102.8 kPa
Effective temperature = 4° C
T = 277.15 K

ω = 0.0045

$\omega = \dfrac{0.622\, P(v)}{P - P(v)}$

$0.0045 = \dfrac{0.622\, P(v)}{102.8 - P(v)}$

P_v = 0.738 kPa

Volume = 16 x 8 x 4 = 512 m³
$M_{air} = P_a V_a / R_a T \times (R_{sp} \times T) = 0.738 \times 512 / 0.4615\,(277.15 + 4) = 2.912$ Kg
M_g = mass of water at stable condition
$\phi = m_v / m_g = 2.912 / 0.86 = 5.02$ Kg

Task 2

Height of building = 2.5 m^2
Wall area = 144 m^2

Internal glass:

$Q_{sensible}$ = 136 + 2.2 A_{cf} + 22 N_{oc}
= 136 + 2.2x200 + 22x2 = 620 W

Q_{latent} = 20 + 0.22 A_{cf} + 12N_{oc}
= 20 + 0.22x200 + 12x2 = 88 W

Infiltration
Good quality – A_{ul} = 1.4 cm^2 /m^2
A_L = A_{es} x A_{ul}
= (200 + 144) x 1.4
= 481.6 cm^3

Q_L = A_L x IDF
IDF cooling = 0.03L/5cm^2

$V_{infiltration(heating)}$ (Q_L) = A_L x IDF = 481.6 x 0.073 = 35.16 L/S
$V_{infiltration(cooling)}$ (Q_L) = A_L x IDF = 481.6 x 0.033 = 15.89 L/S

Ventilation
Q_V ($V_{inf-ventilation heating}$) = 35.16 + 17 = 52.16 L/S
Q_V ($V_{inf-ventilation cooling}$) = 15.89 + 17 = 32.89 L/S

The required minimum whole building ventilation rate in Brindisi

$\Delta T_{cooling}$ = 31.1 – 24 = 7.1 ^{o}C
$\Delta T_{heating}$ = 21 – (-4.1) = 25.1 ^{o}C

DR = 7.1 ^{o}C
$C_{sensible}$ = 1.23, C_{latent} = 3010
$\Delta \omega_{cooling}$ = 0.0039

$\dot{Q}_{inf-ventilation(cooling)(sensible)}$ = C_{latent} x $\dot{V} \Delta \omega_{cooling}$ = 3010 x 32.89 x 0.0039 = 386.13 W
$\dot{Q}_{inf-ventilation(cooling)(latent)}$ = $C_{sensible}$ x $\dot{V} \Delta T_{heating}$ = 1.23 x 52.16 x 25.1 = 1610.34 W