martes, 3 de diciembre de 2019 10:49 p. m.

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Task 1:

Use a weather forecast website, and utilize the psychrometric chart and the formula we went through in the class to determine the absoloute humidity, the wet-bulb temperature and the mass of water vapour in the air in ClassRoom A (Aula A) of Piacenza campus in the moment that you are solving this exercise (provide the inputs that you utilized).

Room Aula A (aprox measures) : 14 * 7.4 * 4
T= 25 C
P= 100 kPa
ϕ Humidity according with Piacenza´s cast $= 85\%$

Saturation pressure of water 25 C = 3.1698 kPa

$$\phi = \frac{P_v}{P_g} \rightarrow P_V = \phi \times P_g = 0.85 * 3.1698 = 2.69\ kPa$$

$$partial\ pressure\ of\ dry\ air:\ P_a = P - P_v = 100\ kPa - 2.69\ kPa = 97.31\ kPa$$

$$\omega = 0.622 \frac{P_v}{P_a} = 0.622 \frac{2.69}{97.31} = 0.0171 \frac{Kg_{vapour}}{kg_{dryAir}}$$

For air : $m_a = \frac{P_a V_a}{R_a T}$ $\quad R_{sp.} = \frac{R_{global}}{M_{gas}} \dashrightarrow R_a = 0.287 \quad R_v = 0.4615$

$$m_a = \frac{97.31 * (14 * 7.4 * 4)}{0.287 * (273 + 25)} = \frac{40,325.26}{85.52}$$
$$= 471.53\ kg$$

$$m_v = \frac{2.69 * (14 * 7.4 * 4)}{0.4615 * (273 + 25)} = \frac{1114.73}{137.52} = 8.10\ kg$$

$$\omega = 0.017\ kg\ air\ vapour$$

$$Twb = 25\ C$$

Task 2:
Utilize the same methodology we went through in the class and determine the sensible and latent load corresponding to internal gains, the ventilation, and the infiltration in a house with a *good* construction quality and with the same geometry as that of the example which is located in Brindisi, Italy.

Building height = 2.5m
Floor area = 200 m2
Number of occupants = 2
Number of bedrooms = 1
Wall area = 144 m2

Temperature difference calculation

ΔT cooling= 31.1 - 24 = 7.1 °C
ΔT heating=20 - 4.1 = 15.9°C
DR = 7.1 °C

Internal gains

$$\dot{Q}ig\ sensible = 136 + 2.2\ Acf + 22\ Noc = 136 + 2.2\ x\ 200 + 22x\ 2 = 620\ \mathrm{W}$$
$$\dot{Q}ig\ latent = 20 + 0.22\ Acf + 12\ Noc = 20 + 0.22\ x\ 200 + 12\ x\ 2 = 88\ W$$

Infiltration

$$Aul = 14\frac{cm2}{m2}$$

$$Aes = 200 + 144 = 344\ m2$$

$$AL = Aes\ x\ Aul = 344\ x\ 1.4 = 481.6\ cm2$$

IDF heating= $0.063\frac{L}{s.cm2}$

$$IDFcooling = 0.053\ \frac{L}{s.cm2}$$

$$\dot{Q}ig\ heating = AL\ x\ IDF = 481.6\ x\ 0.063 = 30.34\frac{L}{s}$$

$$\dot{Q}ig\ cooling = AL\ x\ IDF = 481.6\ x\ 0.053 = 25.52\ \frac{L}{s}$$

Ventilation

$$\dot{Q}v = 0.05\ Acf + 3.5\ (Nbr + 1) = 0.05\ x\ 200 + 3.5\ x\ 2 = 17\ \frac{L}{s}$$

$$\dot{Q}\ \mathrm{inf} - ventilation\ heating = 30.34 + 17 = 47.34\ \frac{L}{s}$$

$$\dot{Q}\ \mathrm{inf} - ventilation\ cooling = 25.52 + 17 = 42.52\ \frac{L}{s}$$