Amirhossein Roustaei 10689304 04/12/2019

1.

Time: 18:00 Tuesday 04 December 2019
The relative humidity φ =90%
Total air pressure P =101.9 kPa
T =230 K

web-bulb temperature T_{wb} = 6 °C

absolute humidity ω = 0.0055

$\omega = 0.622P_v / P_a = 0.622P_v / (P - P_v) = 0.0055$,

$P_v \approx 0.893$ kPa

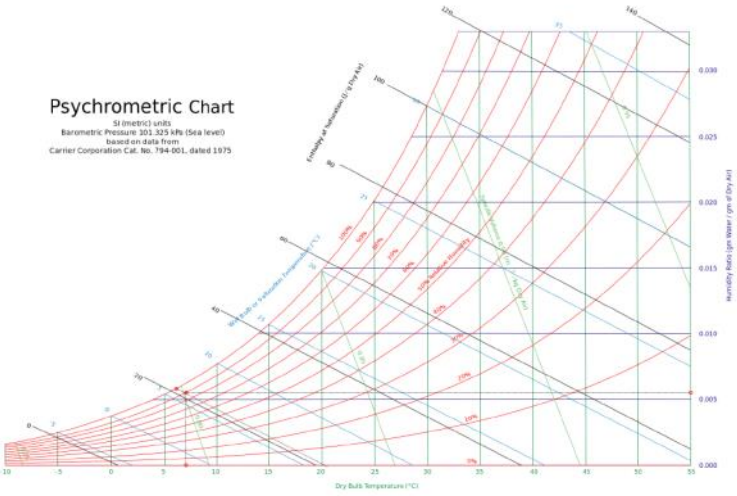
autem, $\varphi = m_v/m_g = 90\%$

$M = P_V / R_{sp}.T$, $R_{sp}. = 0.4615$

V = The volume of Aula A

$M_v = 0.893\ V / 0.4615 * 230 \approx 8.41 \times 10^{-3} V$

$M_g = m_v / 90\% \approx 9.34 \times 10^{-3} V$



2.

Internal gains:

$q_{ig,s} = 136 + 2.2\ A_{cf} + 22\ N_{oc} = 136 + 2.2 * 200 + 22 * 2 = 620$ W
$q_{ig,l} = 20 + 0.22\ A_{cf} + 12\ N_{oc} = 20 + 0.22 * 200 + 12 * 2 = 88$ W

Infiltration:

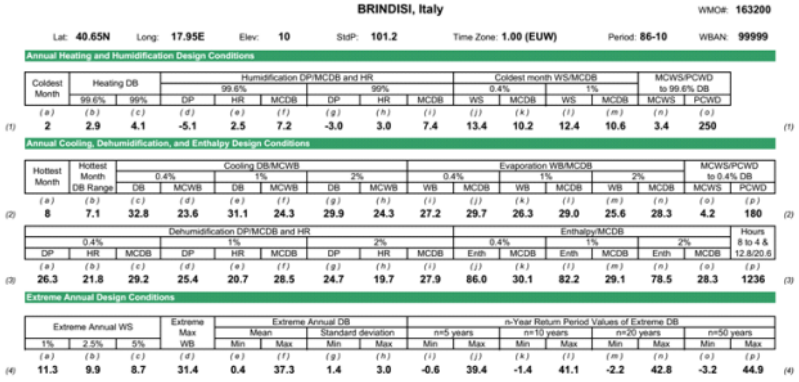
unit leakage area $A_{ul} = 1.4\ cm^2/m^2$
exposed surface $A_{es} = A_{wall} + A_{roof} = 200 + 144 = 344\ m^2$

$A_L = A_{es} * A_{ul} = 344 * 1.4 = 481.6\ cm^2$

Δ Tcooling = 31.1 °C −24 °C = 7.1 °C = 7.1 K
Δ Theating= 20 °C − (−4. 1 °C) = 24.1 °C = 24.1 K
DR = 7.1 °C = 7.1 K

$IDF_{heating} = 0.073$ L / S∗cm²
$IDF_{cooling} = 0.033$ L / S∗cm²

$Q_{i,\ heating} = AL * IDF_{heating} = 481.6 * 0.073 \approx 35.157$ L / S
$Q_{i,\ cooling} = AL * IDF_{cooling} = 481.6 * 0.033 \approx 15.893$ L / S



$Q_v = 0.05\ A_{cf} + 3.5\ (N_{br} + 1) = 0.05 * 200 + 3.5 * (1+1) = 17$ L/S

$Q_{i-v,heating} = Q_{i,\ heating} + Qv \approx 35.157 + 17 = 52.157$ L/S
$Q_{i-v,cooling} = Q_{i,\ cooling} + Qv \approx 15.893 + 17 = 32.893$ L/S

$C_{sensible} = 1.23$, $C_{latent} = 3010$, $\Delta_{\omega Cooling} = 0.0039$

$Q_{\ inf-ventilation,\ cooling,\ sensible} = C_{sensible}\ Q_{i-v,\ cooling}\ \Delta T_{Cooling}$
$\approx 1.23 * 32.893 * 7.1 \approx 287.25$ W
$Q_{\ inf-ventilation,\ cooling,\ latent} = C_{latent}\ Q_{i-v,\ cooling}\ \Delta T_{\omega Cooling}$
$\approx 3010 * 32.893 * 0.0039 \approx 386.13$ W
$Q_{\ inf-ventilation,heating,\ sensible} = C_{sensible}\ Q_{i-v,heating}\ \Delta T_{heating}$
$\approx 1.23 * 52.157 * 24.1 \approx 1546.9$ W