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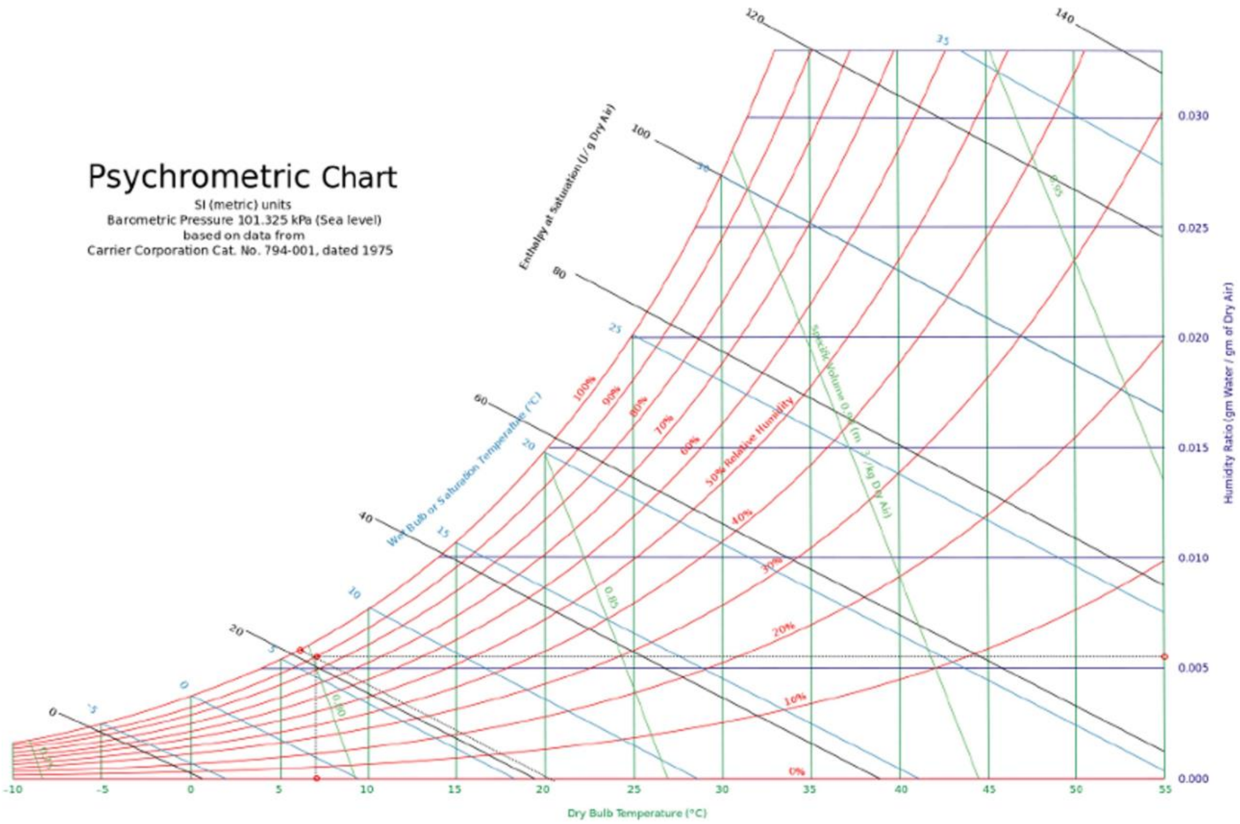
Task 1

The time now is 20:00, from the data given in the website https://www.meteo-ggi.it/italia/regione-emilia-romagna/tempo-piacenza/

umidità: 90%, i.e., the relative humidity
$
=90%;

pressione atmosferica: 1019 hPa, i.e., the total air pressure P =101.9 kPa;

temperatura effttiva: 7
℃
, i.e., the temperature in Kelvin temperature scale T =230 K



Utilize the psychrometric chart, we can see, the humidity ratio, i.e., the absolute humidity

w

= 0.0055

the web-bulb temperature

□w=0.622PvPa=0.622PvP−Pv=0.0055, introduce P=101.9 kPa into this equation, and solve it,

Pv=0.893 kPa

autem, $=mvmg=90%……(1)

for any ideal gas, m=PVRsp.T , during the class we were told that for water vapour, Rsp.=0.4615

introduce the pressure of water vapor
Pv=0.893 kPa, and define the volume of aula A is V, here we have:

mv=0.893V0.4615×230 =8.41×10−3V

subodinate this value to equotion (1), calculate the maximun water vapour mg,

mg=mv90%=9.34 ×10−3V

Task 2

Internal gains,

Calculate the sensibile cooling load from internal gains,

qig, s=136+2.2Acf+22Noc=136+2.2×200+22×2=620 W

Calculate the latent cooling load from internal gains,

qig, l=20+0.22Acf+12Noc=20+0.22×200+12×2=88 W

Infiltration,

for a house with a good construction quality, unit leakage area

Aul=1.4cm2/m2

and the exposed surface

Aes=Awall+Aroof=200+144=344 m2

thus,
$AL=Aes \times Aul=344 \times 1.4=481.6$ cm2

Define the cooling temperature $T_{cooling}=24\ ^{o}C$, and
heating temperature $T_{heating}=20\ ^{o}C$

in Brindisi,

[Equazione]

O Tcooling=31.1 °C −24 °C=7.1 °C=7.1 K

O Theating=20 °C −(−4. 1 °C)=24.1 °C=24.1 K

DR = 7.1 °C=7.1 K

Given that IDFheating=0.073Ls×cm2,

IDFcooling=0.033Ls×cm2 ,

Calculate infiltration airflow rate,

Qi, heating=AL×IDFheating=481.6×0.073=35.157Ls

Qi, cooling=AL×IDFcooling=481.6×0.033=15.893Ls

The required miminum whole-building vetilation rate is

Qv=0.05Acf+3.5(Nbr+1)=0.05×200+3.5×(1+1)=17Ls

thus,

Qi−v,heating =Qi, heating+Qv=35.157+17=52.157Ls

Qi−v, cooling=Qi, cooling+Qv=15.893+17=32.893Ls

Given that
Csensible=1.23 , Clatent=3010, OwCooling=0.0039

q.inf−ventilationcoolingsensible=CsensibleQi−v, cooling OTCooling=1.23 ×32.893×7.1=287.25 W

q.inf−ventilationcoolinglatent = ClatentQi−v, cooling OwCooling=3010 ×32.893 × 0.0039=386.13 W

q.inf−ventilationheatinggsensible=CsensibleQi−v, heating OTheating=1.23 ×52.157×24.1=1546.09 W