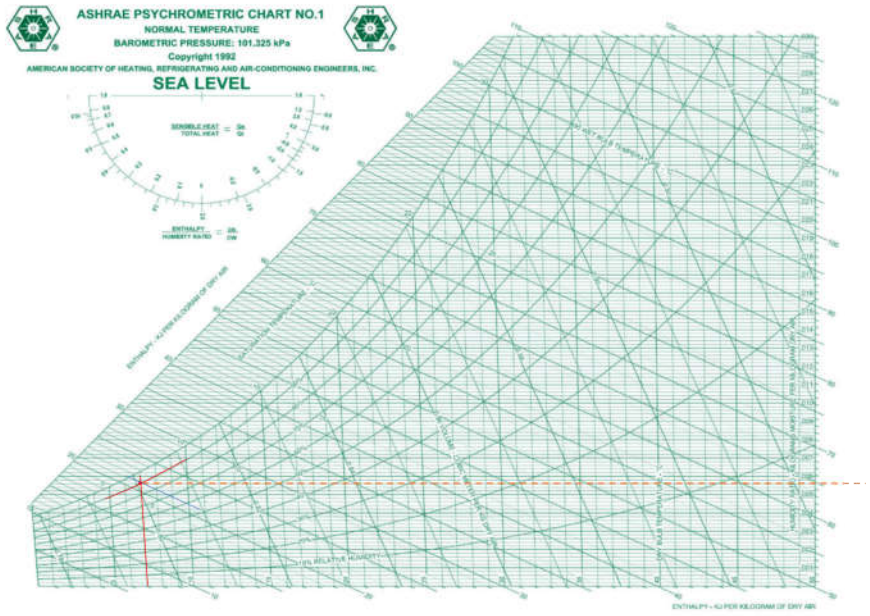
Week 9

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)

Piacenza weather:

Monday 02/12- 20:00 pm:
- Temperature: 7°C
- Humidity: 90%



the humidity ratio = 0.0055

the web-bulb temperature Twb = *6* °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

Table 3 Unit Leakage Areas

Construction	Description	A_{ul}, cm²/m²
Tight	Construction supervised by air-sealing specialist	0.7
Good	Carefully sealed construction by knowledgeable builder	1.4
Average	Typical current production housing	2.8
Leaky	Typical pre-1970 houses	5.6
Very leaky	Old houses in original condition	10.4

Average quality -> $A_{ul} = 1.4 \frac{cm^2}{m2}$
Exposed surface = Wall area +roof area
$A_{es} = 200 + 144 = 344\ m^2$
$A_L = A_{es} \times A_{ul} = 344 \times 1.4 = 481.6\ cm^2$

Tcooling =*4 °C*
heating temperature Theating =*20 °C*

in Brindisi,
Δ Tcooling= 31.1 °C −24 °C = 7.1 °C = 7.1 K

Δ Theating= 20 °C −(4. 1 °C) = 24.1 °C = 15.9 K

DR = 7.1
°C=7.1 K

Given that IDFheating=0.073Ls∗cm2,
IDFcooling=0.033Ls∗cm2 ,

Calculate infiltration airflow rate,

$Qi_{heating} = AL * IDF_{heating} = 481.6 * 0.073 = 35.157 Ls$

$Qi_{cooling} = AL * IDF_{cooling} = 481.6 * 0.033 = 15.893 Ls$

The required miminum whole-building vetilation rate is

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

$Qi-v_{heating} = Qi, heating + Qv = 35.157 + 17 = 52.157 Ls$

$Qi-v, cooling = Qi, cooling + Qv = 15.893 + 17 = 32.893 Ls$

Given that
Csensible=1.23
Clatent=3010
ΔωCooling=0.0039

$q.inf-ventilationcoolingsensible = Csensible * Qi-v, cooling * \Delta TCooling$
$= 1.23 * 32.893 * 7.1$
$= 287.25 W$

$q.inf-ventilationcoolinglatent = Clatent * Qi-v\ cooling * \Delta\omega Cooling$
$= 3010 * 32.893 * 0.0039$
$= 386.13 W$

$q.inf-ventilationheatinggsensible = Csensible * Qi-v, heating * \Delta theating$
$= 1.23 * 52.157 * 15.9$
$= 1020.034 W$