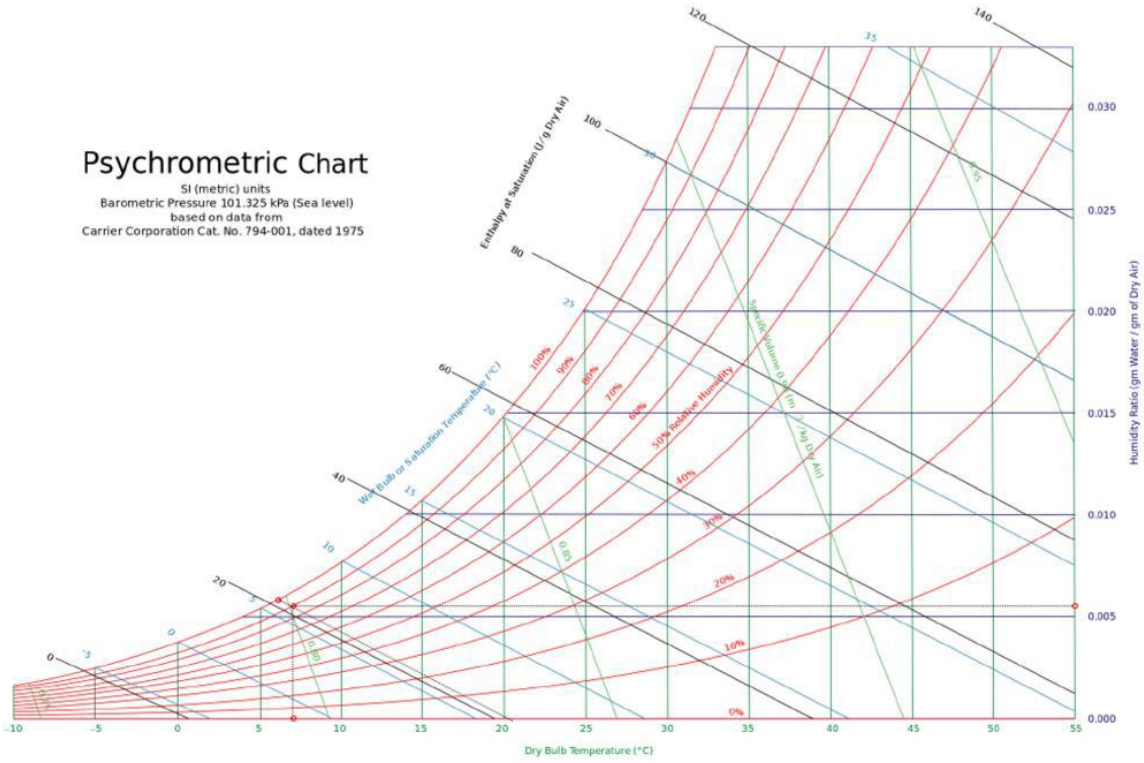
Task 1 : Use a weather forecast website, and utilize the psychrometric chart and the formula we went through in the class to determine the absolute humidity, the wet-bulb temperature and the mass of water vapour in the air in ClassRoom A (Aula A) of Piacenza campus in the moment that you are solving this exercise (provide the inputs that you utilized) Weather Forecast Website example)

Umidità: Relative humidity, Pressione atmosferica: Air total pressure (1 hPa: 0.1 kPa), Temperatura effettiva: temperature to be utilize



According to the psychrometric chart, ω= 0.0055 The wet bulb temperate is Twb= 6C

$\omega=\frac{0.622Pv}{Pa}=\frac{0.622\mathrm{Pv}}{\mathrm{P-Pv}}$= 0.005

Introduce P=101.9kPA into the equation Pv=0.893 kPA $\phi=\frac{\mathrm{mv}}{\mathrm{mg}}=90\%$

For ideal gases $m=\frac{\mathrm{PV}}{\mathrm{RspT}}$ We know that Rsp=0.4615

the pressure of water vapor Pv=0.893kPa

The volume of Aula A = V

$mv=\frac{0.893\mathrm{V}}{0.4615*230}=8.41*10^{-3}v$ $mg=\frac{\mathrm{mv}}{90\%}=9.34*10^{-3}V$

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

BRINDISI, Italy WMO#: **163200**

Lat: **40.65N** Long: **17.95E** Elev: **10** StdP: **101.2** Time Zone: **1.00 (EUW)** Period: **86-10** WBAN: **99999**

Annual Heating and Humidification Design Conditions

	Coldest Month	Heating DB		Humidification DP/MCDB and HR						Coldest month WS/MCDB				MCWS/PCWD to 99.6% DB	
				99.6%			99%			0.4%		1%			
		99.6%	99%	DP	HR	MCDB	DP	HR	MCDB	WS	MCDB	WS	MCDB	MCWS	PCWD
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)
(1)	2	2.9	4.1	-5.1	2.5	7.2	-3.0	3.0	7.4	13.4	10.2	12.4	10.6	3.4	250

Annual Cooling, Dehumidification, and Enthalpy Design Conditions

	Hottest Month	Hottest Month DB Range	Cooling DB/MCWB						Evaporation WB/MCDB						MCWS/PCWD to 0.4% DB	
			0.4%		1%		2%		0.4%		1%		2%			
			DB	MCWB	DB	MCWB	DB	MCWB	WB	MCDB	WB	MCDB	WB	MCDB	MCWS	PCWD
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
(2)	8	7.1	32.8	23.6	31.1	24.3	29.9	24.3	27.2	29.7	26.3	29.0	25.6	28.3	4.2	180

	Dehumidification DP/MCDB and HR									Enthalpy/MCDB						Hours
	0.4%			1%			2%			0.4%		1%		2%		8 to 4 &
	DP	HR	MCDB	DP	HR	MCDB	DP	HR	MCDB	Enth	MCDB	Enth	MCDB	Enth	MCDB	12.8/20.6
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
(3)	26.3	21.8	29.2	25.4	20.7	28.5	24.7	19.7	27.9	86.0	30.1	82.2	29.1	78.5	28.3	1236

Extreme Annual Design Conditions

	Extreme Annual WS			Extreme Max	Extreme Annual DB				n-Year Return Period Values of Extreme DB							
					Mean		Standard deviation		n=5 years		n=10 years		n=20 years		n=50 years	
	1%	2.5%	5%	WB	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
(4)	11.3	9.9	8.7	31.4	0.4	37.3	1.4	3.0	-0.6	39.4	-1.4	41.1	-2.2	42.8	-3.2	44.9

Task 2:

Noc=2

Height=2.5m2

Conditioned Floor Area=200m2

$\dot{Q}_{\text{igsensible}}$=136+2.2$A_{\text{cf}}$+22$N_{\text{oc}}$ = 136+2.2(200)+22(2) =**620*W***

$\dot{Q}_{\text{iglatent}}$ =20+0.22Acf+12Noc =20+0.22(200)+12(2) =**88*W***

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

Situation	Include	Exclude
Ceiling/roof combination (e.g., cathedral ceiling without attic)	Gross surface area	
Ceiling or wall adjacent to attic	Ceiling or wall area	Roof area
Wall exposed to ambient	Gross wall area (including fenestration area)	
Wall adjacent to unconditioned buffer space (e.g., garage or porch)	Common wall area	Exterior wall area
Floor over open or vented crawlspace	Floor area	Crawlspace wall area
Floor over sealed crawlspace	Crawlspace wall area	Floor area
Floor over conditioned or semiconditioned basement	Above-grade basement wall area	Floor area

Aul (ideal)=1.4 $\frac{cm^2}{m^2}$

A_{es}=A_{wall}+A_{roof}= 200+144 = 344m^2

AL=Aes×Aul=344×1.4=481.6cm^2

The cooling temperature in Brindisi ⟶ $Tcooling$=24°C

The heating temperature in Brindisi ⟶ $Theating$=20°C

Δ$Tcooling$ = 31.1°C−24°C=7.1°C=7.1K

Δ$Theating$ = 20°C−(−4.1)°C=24.1°C=24.1K

DR=7.1°C = 7.1K

Is given ⟶ $IDFheating$=0.073 $\frac{L}{\text{s.cm}^2}$ $IDFcooling$=0.033 $\frac{L}{\text{s.cm}^2}$

$V_{\text{infiltration heating}} = A_L IDF$ = 481.6×0.073=35.157$\frac{L}{s}$

$V_{\text{infiltration cooling}} = A_L IDF$

=481.6×0.033=15.89$\frac{L}{s}$

$\dot{V}_{\text{ventilation}}$=0.05$Acf$+3.5($Nbr$+1)= 0.05×200+3.5×2=17$\frac{L}{s}$

$\dot{V}_{\text{inf−ventilation heating}}$ =35.157+17=52.157$\frac{L}{s}$

$\dot{V}_{\text{inf−ventilation cooling}}$ =15.89+17=32.893

Is given ⟶ $C_{sensibe}$ =1.23, C_{latent}=3010, $\Delta\omega_{cooling}$ =0.0039

$\dot{Q}_{\text{inf− ventilation heating sensible}}$=$C_{\text{sensible}}\dot{V}\ \Delta T_{\text{heating}}$ =1.23×52.157×24.1=1546.09W

$\dot{Q}_{\text{inf− ventilation cooling sensible}}$=$C_{\text{sensible}}\dot{V}\ \Delta T_{\text{cooling}}$ =1.23×32.893×7.1=287.25W

$\dot{Q}_{\text{inf− ventilation cooling latent}}$=$C_{\text{latent}}\dot{V}\ \Delta w_{\text{cooling}}$ =3010×32.893×0.0039=386.13W