week9

3 Aralık 2019 Salı
06:54

QUESTION 1:

USE A WEATHER FORECAST WEBSİTE,AND UTILIZE THE PSYCHROMETRIC CHARTAND THE FORMULA WE WENT THOUGH İN THE CLASS O DETERMINE THE ABSOLUTE HUMIDITY ,THE WET- BULB TEMPERTURE AND THE MASS OF WATER VAPOUR INTHE AIR IN CLASSROOM A (AULA A) OF PIACENZA CAMPUS İN THE MOMENT THAT YOU ARE SOLVING THIS EXERCISE.

Date : 04.DEC 2019 ,14.00 ,Piacenza
Relative Humidity :67%
Temprature :8 ^{0}C
Athmosphere Pressure : 1025 hPa = 102.5 kPa (the color chat is approprıate)

Absolute humidity :0.005
Wet - bulb temprature : 6 ^{0}C

Mass of the vapuor :

$\emptyset$ =(m_v / m_g) = (P_v / P_g) -→ P_g = P_{sat} 8 ^{0}C =1.061 kPa
$\emptyset$ =(P_v / P_g) → P_v = $\emptyset$ x $P_{g=}$0.67 * 1.061 = 0.71 kPa

V of Aula A : 30 *10* 4
V = 1200 m^3

M_v = (0.71 * (30* 10* 4)) / (0.4615 *(273+8))
Mv = 6,56 kg

QUESTION 2:

UTILIZE THE SAME METHODOLOGY WE WENT THOUGH 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 LOCATION IN BRINDISI , ITALY

Heıght : 2.5 m
Floor area :200 m^2
Wall area :144 m^2
Constructıon qualıty : good
One bedroom
Brindisi ; two occupants

$$q_{ig,s} = 136 + 2.2A_{cf} + 22N_{oc}$$

$$q_{ig,l} = 20 + 0.22A_{cf} + 12N_{oc}$$

where

$q_{ig,s}$ = sensible cooling load from internal gains, W
$q_{ig,l}$ = latent cooling load from internal gains, W
A_{cf} = conditioned floor area of building, m^2
N_{oc} = number of occupants (unknown, estimate as N_{br} + 1)

A- INTERNAL GAINS

Q $_{ig\ senseible}$= 136 +2.2 * A_{cf} + 22 N_{oc} = 136 + 2.2 *200 +22 * 2 = 620 W
Q $_{ig\ latent}$= 20 + 0.22 * A_{cf} + 12 N_{oc} = 20 + 0.22 * 200 + 12 * 2 = 88 W

B- INFILTRATION

$$Q_i = A_L \text{IDF}$$

where

A_L = building effective leakage area (including flue) at reference pressure difference = 4 Pa, assuming discharge coefficient C_D = 1, cm^2
IDF = infiltration driving force, L/(s·cm^2)

Table 3 Unit Leakage Areas

Construction	Description	A_{ul}, cm^2/m^2
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

A_L= A_{ES} * A_{UL}

Where ;

A_{ES}= building exposed surface area ,m^2
A_{UL} =unit leakge are , cm^2 /m^2 (from table 3)

Good qualit > A_{ul} = 1.4 cm^2/ m^2

Expossed surface = wall area + roof area

A_{es}= 200+144=344 m^2
A_l= A_{es} x A_{ul} = 344 * 1.4= 481.6 cm^2
IDF $_{heating}$ = 0.065 L/s*cm^2
IDF $_{cooling}$ = 0.031 L/s*cm^2
$V_{ınfiltration\ heating}$ = A_L * IDF = 481.6* 0.065 = 31.304 L/S
$V_{ınfiltration\ cooling}$ = A_L * IDF = 481.6* 0.031 = 14.93 L/S

Table 5 Typical IDF Values, L/(s·cm^2)

H, m	Heating Design Temperature, °C					Cooling Design Temperature, °C			
	–40	–30	–20	–10	0	10	30	35	40
2.5	0.10	0.095	0.086	0.077	0.069	0.060	0.031	0.035	0.040
3	0.11	0.10	0.093	0.083	0.072	0.061	0.032	0.038	0.043
4	0.14	0.12	0.11	0.093	0.079	0.065	0.034	0.042	0.049
5	0.16	0.14	0.12	0.10	0.086	0.069	0.036	0.046	0.055
6	0.18	0.16	0.14	0.11	0.093	0.072	0.039	0.050	0.061
7	0.20	0.17	0.15	0.12	0.10	0.075	0.041	0.051	0.068
8	0.22	0.19	0.16	0.14	0.11	0.079	0.043	0.058	0.074

C- VENTILATION

$V_{ventilatıon}$ = 0.05 A_{cf} + 3.5 (N $_{br}$ +1)=0.05 * 200 +3.5 * 2 =17 L/S
$V_{inf\ -\ ventilatıon\ heating}$ = 31.304 + 17 =48.304 L/S
$V_{inf\ -\ ventilatıon\ cooling}$ = 14.98 + 17 =31.98 L/S

Q=0.05A_{cf} + 3.5 (N $_{br}$ +1)

Where

$C_{sensible} = 1.23$,
$C_{latent} = 3010$

Q_v = required ventilation fow rate L/S
A_{cf} = BUİLDİNG CONDİTİONED FLOOR AREA m^2
N_{br} = number of bedrooms (not less than 1)

$Q_{inf\text{ - ventilatıon heating sensible}} = C_{sensible} * V* \ \Delta T_{heating} = 1.23 * 48.304* 15.9 = 944.68$ w
$Q_{inf\text{ - ventilatıon cooling sensible}} = C_{sensible} * V* \ \Delta T_{cooling} = 1.23 * 31.98 * 11.1 = 436.62$w
$Q_{inf\text{ - ventilatıon cooling latent}} = C_{latent} * V* \ W_{cooling} = 3010 * 31.98 * 0.0039 = 375.41$w

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 8 to 4 & 12.8/20.6
	0.4%			1%			2%			0.4%		1%		2%		
	DP	HR	MCDB	DP	HR	MCDB	DP	HR	MCDB	Enth	MCDB	Enth	MCDB	Enth	MCDB	
	(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 WB	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%		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**