Task 2

Considering the house that we analyzed in the last two examples, calculate the heating and cooling load of the other windows which are fixed 14.4 sqm on the west, fixed 3.6 sqm on the south and an operable 3.6 sqm on the south (the same window and frame type). How much does the total value change if I change the frame of the window from wooden one to aluminum?

PIACENZA, Italy WMO#: **160840**

Lat: **44.92N** Long: **9.73E** Elev: **138** StdP: **99.68** Time Zone: **1.00 (EUW)** Period: **89-10** 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	-6.2	-4.8	-11.6	1.4	3.1	-8.8	1.8	1.8	8.8	5.6	7.7	6.2	2.1	250

(1)

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)
8	11.9	33.1	22.7	31.9	22.4	30.3	21.8	24.6	30.2	23.7	29.2	22.9	28.3	2.4	90

(2)

DTcooling=31.9-24=7.9 C

DTheating = 20 +4.8 =24.8 C

DR=11.9C

- <u>WEST WINDOW: FIXED</u>
- <u>COOLING LOAD: WOOD FRAME:</u>

  Qwindoww= A*CFwindoww

  A=14m2

  CFwindoww=CFwindowwheattransfer +CFwindowwirradiation

  CFwindoww= U(DT – 0.46DR)+ PXI*SHGC*IAC*FFs

  CFwindowwht=2.84(7.9-(0.46*11.9)=6.89 w/m2

  CFwindowwir=PXI*SHGC*IAC*FFs

  PXI=ED- Ed=559+188=747

  CFwindowwir=747*0.54*1*0.56=225.89w/m2

CFwindoww=CF windowht + CF windowir
=6.89+225.89=232.78 w/m2
Qwindow= A*CF=3352.07W

- <u>COOLING LOAD: AMLUMINUM FRAME</u>
  CFwindowwht= 3.61(7.9-(0.46*11.9)=8.76w/m2
  CFwindowir=747*0.56.1.0.56=2334.26w/m2
  CFwindoww=8.76+234.26=243.02W/m2
  qwindoww=A*CFwindow= 3499.7W

- <u>HEATING LOAD: WOOD FRAME</u>
  HFwindoww=Uwindoww*DTheating
  =2.84*24.8=70.43W/m2
  q=14.4*70.43=1.14.22W

- <u>HEATING LOAD: ALUMINUM FRAME</u>
  HF=3.61*24.8=89.53 W/m2
  q=14.4*89.53=1289.20W

Difference: the cooling load=147.4W
the heating load= 274.98 W

- <u>SOUTH WINDOW: FIXED</u>
- <u>COOLING : WOOD</u>
  CFws-ht=2.84(7.9-(0.46*11.9)=6.89 w/m2
  CFws-ir=557*0.54*0.47=141.37 w/m2
  CFws=6.89+141.37=148.26 w/m2
  q=3.6*148.26=533.75 w

- <u>COOLING ALUMINUM FRAME:</u>
  CFws-ht=3.61(7.9-(0.46*11.9)=8.76w/m2
  CFws-ir=557*0.56*1*0.4=146.60 w/m2
  CFws=8.76+146.60+155.36 w/m2
  qws=3.6*155.36=559w

- <u>HEATING WOOD FRAME</u>
  HFws=2.84*24.8=70.43w/m2
  qws=3.6*70.43=253w

- <u>HEATING ALUMINUM FRAME:</u>
  HFws=3.61*24.8=89.53 w/m2
  qws=3.6*89.53=322.31