#Week 3

In this week's assignment you should first dfinlize the composite wall question by finding the heat transfer rate, and then solve the same question while the thickness of the brick is increased to 32 cm and comment on the results

• You should solve again the simplified wall calculation procedure replacing the glass fiber one with urethane rigif foam and while replacing the fiberboard with plywood and find the two R_unit values

Question1:

1. Finding the heat transfer rate of the composite wall (exercise started in class):

1) Finding total resistance of the wall:

Rtotal=Rconv1+Rfoam+Rplaster1+Rtotal(plaster^;brick;plaster$_v$)+Rplaster2
+Rconv2

Rtotal=1/(10*0.25)+0.03/(0.026*0.25)+0.02/(0.22*0.25)+0.97+0.02/(0.22*0.25)+ 1/(40*0.25)

Rtotal=0.4+4.61+0.36+0.97+0.36+0.1= 6.8 (C/W)

2) Finding the rate of heat transfer through the wall:

Q=(Tinf1-Tinf2)/6.8

Q=(20-(-10))/6.8=30/6.8=4.4117 (W)

2. Solving the same exercise with the thickness of the brick = 32(cm) with comments on the results:

1) Finding the total resistance of the 3 parallel layers:

Rplaster^=Rplaster$_v$=Lplaster^/(kplaster^*Aplaster^)=0.32/(0.22*0.015)=96.96;

1/96.96=0.01 C/W

Rbrick=Lbrick/(kbrick*Abrick)=0.32/(0.72*0.22)=2.02 C/W;

1/2.02=0.49 C/W

Rtotal(3layers in parallel)=0.01*2+0.49=0.51;

1/0.51=1.96 C/W

2) Finding the total resistance of the wall:

Rtotal=Rconv1+Rfoam+Rplaster1+Rtotal(3 layers in parallel)+Rplaster2+Rconv2

Rtotal=0.4+4.61+0.36+1.96+0.36+0.1=7.79 C/W

3) Finding the rate of heat transfer through the wall:

$Q = (Tinf1 - Tinf2) / 7.79$

$Q = (20 - (-10)) / 7.79 = 30/7.79 = 3.851$ W

4) Comments:

Comparing the result of the current exercise (thickness of the brick=32(cm)), with the original task (brick=16(cm)), it is evident, that increasing the thickness of the brick only slightly increases the total resistance of the wall, and the rate of heat transfer through it drops insignificantly. The main parameter, that could change the rate more, is the thickness of the foam layer.

3. Solving the simplified wall calculations procedure with a replacement of the glass fiber one > urethane rigid foam; fiberboard > plywood, and finding the two R_unit values :

	Wood	Insulation
Outside Air	0.03	0.03
Wood Bevel(13mm*200mm)	0.14	0.14
Polywood(13mm)	0.11	0.11
Urethane Rigif Foam Ins.(90mm)	No	0.98*90/25=3.528
Wood Studs(90mm)	0.63	No
Gypsum Board(13mm)	0.079	0.079
Inside Surface	0.12	0.12