Weekly submission 3

Part 1

Heat Transfer Rate through Composite Wall: 3m high, 5m wide wall, 32 cm long, with a 22 cm cross section of brick, for which k=0.72 w/m C. Separated by 3 cm plaster layers, for which k= 0.22 W/m C. On each side of the brick layer exists 2 cm thick plaster layers and a 3 cm thick rigid foam layer, for which k= 0.026 W/m C. The indoor and outdoor temperatures are 20 and -10 degrees Celsius. The convective heat transfer coefficients on the inside and outside are h1= 10 W/m2 C and h2= 40 W/m2 C.

Rconv1 = 1 / h1A = 1/ (10)(0.25) = 0.4 C/W

Rfoam = L / kA = 0.03 / (0.026)(0.25) = 4.615 C/W

Rplaster up and down = L / kA = 0.32 / (0.22)(0.015) = 96.97 C/W

Rbrick = L / kA = 0.32 / (0.72)(0.22) = 2.02 C/W

Rtotal parallel = (1/96.97) + (1/2.02) + (1/96.97) = 0.5157

Rtotal parallel = (1/0.5157) = 1.9391 C/W

Rplaster left and right = L / kA = 0.02 / 0.022(0.25) = 0.363 C/W

Rconv2 = 1 / h2A = 1 / 40(0.25) = 0.1 C/W

Rtotal wall = 0.4 = 0.4 + 4.615 + 0.363 + 1.94 + 0.363 + 0.1 = 7.781 C/W

Heat Transfer Rate:

Q= (20 -(-10)) / 7.781 = 3.8555 W

Heat Transfer Rate for 16mm thickness of brick:

Q = (20 - (-10)) / 6.81 = 4.4053

By comparing these results we can conclude that the thickness of the brick inside the composite wall does not significantly increase the resistance of the entire wall. Therefore, the rate of heat transfer does not significantly decrease.

Part 2

A wood frame wall, built around 38 mm, 90 mm wood studs, with center to center distance of 400 mm, and a 90 mm wide urethane rigid foam insulation between studs, finished with an interior of 13 mm

gypsum wallboard, and an exterior of 13mm polywood, and a 13mm, 200mm wood bevel lapped side.

Runit with wood = 0.03 + 0.14 + 0.11 + 0.63 + 0.079 + 0.12 = 1.109 m2 C/W

Runit with insulation = 0.03 + 0.14 + 0.11 + 3.528 + 0.079 + 0.12 = 4.007 m2 C/W