Université d'Ottawa · University of Ottawa

Faculté de génie
Génie chimique

Faculty of Engineering
Chemical Engineering

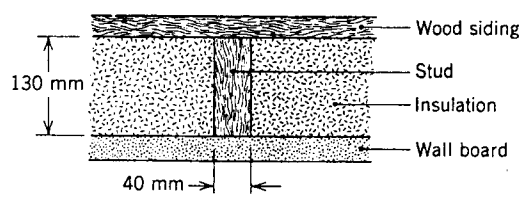
CHG 2314
HEAT TRANSFER

Professor: **B. Kruczek** **2005/01/28**

Assignment No. 3

1. Modified problem 3.15.

   Consider a composite wall that includes an 8-mm-thick hardwood siding, 40 mm by 130 mm hardwood studs on 0.65-m centers with glass fiber insulation (paper faced, 28 kg/m^3), and a 12-mm layer of gypsum (vermiculite) wall board.



   What is the thermal resistance associated with a wall that is 2.5 m high and 6.5 m wide (having 10 studs, each 2.5 m high) assuming that,

   a) surfaces normal to the direction of heat flow are isothermal?
   b) surfaces parallel to the direction of heat flow are adiabatic?

   Which of the calculated values is more realistic and why?

2. Problem 3.40.

   This problem involves solving a nonlinear equation. You may use the software which came along with your textbook, or write your own program using Goal Seek or Solver available in MS Excel.

3. Two identical spherical reactors are insulated with different materials. The first reactor is insulated with a 10 cm layer of fused silica (k_1 = 1.38 W/m K). The inner and outer surface temperatures of the silica insulation are 85°C and 35°C, respectively. The second reactor is covered with an 8 cm thick layer of borosilicate (k_2 = 1.09 W/m K), and the temperature drop across the borosilicate insulation is

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55°C. If the heat losses from both reactors are identical ($q_1 = q_2$), what is the outer diameter of the reactors?

If both reactors are in the same environment ($T_{\infty 1} = T_{\infty 2} = 25°C$) with the same outside heat transfer coefficient ($h_{o1} = h_{o2}$), what are the inner and outer surface temperatures of the borosilicate insulation?

Due Date: **Feb. 4, 2005 at 4:00 p.m. in the assignment box.**