CMGT 235 – Mechanical and Electrical Systems

Homework #2 – Calculating Heat Loss in Buildings

Due: 8/30

**Name**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Calculate the total heat loss due to transmission during a 24-hour period for a flat roof 90 ft X 135 ft. The roof is constructed per the detail below. The inside temperature is 70 °F and the outside temperature is 52 °F. Assume winter conditions. Show all calculations.

A picture containing diagram

Description automatically generated

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| --- | --- | --- | --- |
|  |  | R (Between joist) | R (At joist) |
| 1. | Air film outside |  |  |
| 2. | 3/8 in. Built-up roofing |  |  |
| 3. | 5/8 in. Plywood Sheathing |  |  |
| 4. | 1 ½ in. Air space |  |  |
| 5. | R-15 Fiberglass Batt Insulation |  |  |
| 6. | 5/8 in. Gypsum board |  |  |
| 7. | Air film inside |  |  |
| 8. | Nominal 2-in x 12-in Doug Fir Joist @ 24 in. o.c. |  |  |
| RTotal | |  |  |
| RTotal (Average) | |  | |
| U-Factor (Use Three Decimals) | |  | |

1. An exterior wall is made up of 8" of stone (R= 0.08 per inch), 3" of foamed-in-place polyurethane, and 0.75" Plywood, and 5/8" gypsum board. Determine the total R-value and U-Factor for the wall. Use the lookup table provided in class. Assume winter.

|  |  |
| --- | --- |
| Component | R-Value |
| Wall – Outside Air Film |  |
| 8" stone |  |
| 3" foamed-in-place polyurethane |  |
| ¾" plywood |  |
| 5/8" gypsum board |  |
| Inside Air Film |  |
| Total Wall Assembly R-Value |  |
| U-Factor (Use Three Decimals) |  |

1. If the wall in problem 2 is 40 ft long and 12 ft. high what is the heat loss through the wall for an indoor winter design temperature of 78 °F and an outside temperature of 42°F?