

# ENGINEERING FAIR

## Architectural Engineering

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One of the most important systems in many buildings is the heating, ventilation and air conditioning (HVAC) system. Architects and Architectural Engineers must use their knowledge of the materials used in the building along with science and math to determine the type, size and efficiency of the HVAC equipment to be installed. A basic step in making this decision is to calculate the heat loss/gain of the individual components of the building. If this is done incorrectly it may result in spending more money than is needed on too large a system or, worse yet, installing a system too small to do the job.

The formula for this is  $Q = U (A \Delta T)$

Q = heat loss in British Thermal Units (BTUs) per hour

U = flow of heat (thermal transmittance) through a material, given a difference in temperature on either side. The U factor is determined by first determining the Resistance (R value) to heat flow through the component and then obtaining the reciprocal (1/R)

A = area of given component - for example, square footage of an exterior wall

$\Delta T$  (read as DeltaT) = design temperature difference (this is the difference between the desired inside temperature and a given outside temperature)

Let's assume an R value of 20 for a given wall. Therefore,  
 $U = 1/20 = .05$

Let's further assume an area of 250 square feet.

Finally, we desire an inside temperature of 70 degrees and we have an average winter temperature outside of 35 degrees giving us a difference of 35.

$Q = .05 \times 250 \times 35$

$Q = 437.5$  BTUs/hour transmission load

### Ask students to calculate the following:

1. What is the hourly heat loss of 175 square foot of wall area of R-13 construction when there is a 59F DeltaT
2. What is the hourly heat loss of 500 square feet of wall of R-30 construction when there is a 28F DeltaT

**2018 OKLAHOMA ENGINEERING FAIR  
REGISTRATION DEADLINE - FEBRUARY 7, 2018**

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