

PROBLEM 1-12

Statement: One square foot of ventilation is required for every 150 sq. ft. of floor space on a house with crawl-space under the floor. Prepare an interactive computer program (using, for example *Excel*, *Mathcad*, *MATLAB*, or *TK Solver*) from which the number of 40 cm by 20 cm vents can be determined that meet the ventilation requirement if only 75% of the nominal vent area is effective. Test the program using a house that is 13.5 m long by 8.25 m wide.

Given: Ratio of required floor area to effective vent area: $K := \frac{150 \cdot ft^2}{1 \cdot ft^2} \quad K = 150$

Nominal area of a single vent: $A_{nom} := 40 \cdot cm \cdot 20 \cdot cm$

$A_{nom} = 800 \cdot cm^2$

Solution:

1. Enter the length and width of the house in meters:

Length $L := 13.5 \cdot m$ Width $W := 8.25 \cdot m$

2. Calculate the floor area of the house:

$$A_{floor} := L \cdot W \quad A_{floor} = 111.375 \cdot m^2$$

3. Calculate the total required ventilation area:

$$A_{total} := \frac{A_{floor}}{K} \quad A_{total} = 7425 \cdot cm^2$$

4. Calculate the number of 40 cm x 20 cm vents required (rounded to the next higher integer):

$$N := \text{ceil} \left(\frac{A_{total}}{0.75 \cdot A_{nom}} \right) \quad N = 13$$