

Homework Set #9

The pressure acting on the windows of a high-rise building is $Y = CV^2$, where V is wind speed in km/hr, and C is a local effect factor, the units of which are such that Y is in kg/cm^2 .

The local effect factor and the 10-year peak wind speed at the site of the building have the following mean values and standard deviations:

$$m_C = 0.0001, \quad \sigma_C = 0.0001$$

$$m_V = 100, \quad \sigma_V = 20$$

C and V are uncorrelated.

The strength of the window is $Y^* = 5 \text{ kg/cm}^2$.

- Sketch the failure boundary in (C, V) space for $0.0001 < C < 0.0005$ and $100 < V < 200$.
- Make the corresponding plot in the space of the normalized variables C' and V' :

$$C' = \frac{C - m_C}{\sigma_C} \quad \text{and} \quad V' = \frac{V - m_V}{\sigma_V}$$

- Calculate the second moment reliability index β for a 10-year exposure using the iterative procedure given in class. Operate in the space of the normalized variables C' and V' .
- On the sketch you made, indicate the iterations and show convergence to the β point.