

HOMEWORK 6

ASSIGNED: 10/16/25

DUE: 10/23/25 on ELC (MATLAB script and PDF with results, sketch of selected nodal/element numbering and work done by hand), before class

This is problem 8.6 from your textbook with minor modifications. Consider a chimney constructed of two isotropic materials: dense concrete ($k = 2.0 \text{ W}/\text{°C}$) and bricks ($k = 0.9 \text{ W}/\text{°C}$). The temperature of the hot gases on the inside surface of the chimney is 140 °C , whereas the outside is exposed to the air and fixed at $T = 10 \text{ °C}$. The dimensions in meters are shown below.

Here we exploit symmetry, only considering $1/8^{\text{th}}$ of the chimney cross-sectional area. Mesh the problem with **4 quadrilateral elements, four nodes each for a total of 9 nodes**. Note that the element boundaries have to coincide with the interface between the concrete and the bricks. **Solve for the temperature at the remaining nodes**. Assume no heat flux across the boundaries and no heat generation within the chimney.

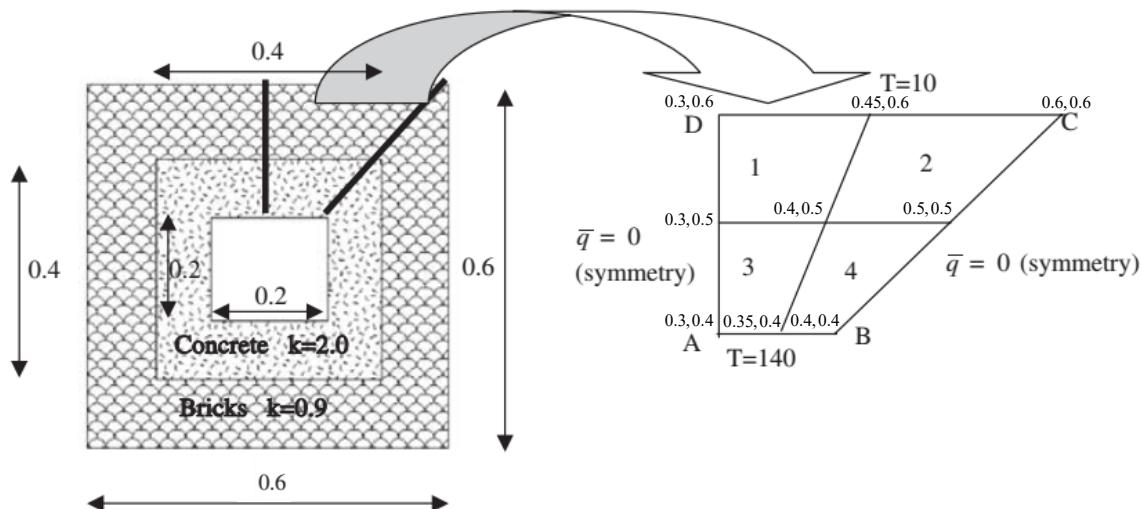


Figure 8.23 Chimney cross section and a four-element finite element mesh for $1/8$ of the problem domain.