

A rectangular cross-section rod is made up of three sections: BC, CD and DH. Sections BC and DH have a linear taper in their thickness, whereas CD has a constant thickness  $h$ . The dimension of the cross-section into the page is a constant value of  $b$ . The material is homogeneous throughout with a Young's modulus of  $E$ . For this problem:

- Draw a free body diagram of the entire rod.
- Assemble the stiffness matrix  $[K]$  and force vector  $\{F\}$  for a four-node (three-element) finite element model for the rod.
- Enforce the boundary conditions on the stiffness matrix and force vector.
- Solve for the displacements at locations C and D on the rod. To find these displacements, you may calculate by hand or using your calculator, Matlab, Mathematica, etc. State your answers in terms of  $P$ ,  $E$ ,  $L$ ,  $h$  and  $b$ .
- Determine the reactions on the rod due to the wall supports.

