

## HONR-310

### Lab 4

Lab 4 is in multiple parts:

- Mini lecture on building foundations and soils
  - Winchester Cathedral foundation problem
- Modern foundation construction and failures
- Soil types, function and identification
- Strength testing of brick (a reasonable simulation of rock) and wood.
  - Test the compression strength of red brick and concrete brick
    - Width and length of the small piece of brick, 2" x 2" or 4" square area.
  - Test a brick as a beam. This gives some idea of strength in tension
- Investigation of "stone" as a beam and wood as a beam.
- Investigation of forces in an arch
- Mini lecture on vector representation of forces.
  - Given two forces acting at a common point ( with the forces represented by two vectors), a method of finding the resultant force vector was shown. The most common method is decomposing the given vectors into x and y component vectors (with x and y being perpendicular to each other) and summing the x components of the two vectors and the y components of the two resulting in new x and y components of a resultant vector. The magnitude and direction of the resultant vector can thus be determined.

Your write-up for this lab should summarize what can be learned from the above parts of the lab. More specifically, it should cover the following items and any other details that caught your notice during this lab.

What type of soil should you build a cathedral on? What if that type of soil is not on the surface but buried? What types of soil did you experience in lab? What soil characteristics are desired for building heavy structures on?

What are the characteristics of brick? Does it behave differently in compression vs tension? How does that influence its use in construction? What are the measured characteristics of the red brick tested in lab? How does wood compare with brick as a building material?

Consider building the walls of a cathedral with the red brick tested in lab. How tall of wall could be built before the wall would crush under its own weight, i.e. the bottom row of bricks would crush?