

# Lab #9: *Civil Engineering* (Chapter 6)

## Mortise and Tenon Joint vs. Butt Joint

### INTRODUCTION:

The objective of this lab is to illustrate to the student the effectiveness of the mortise and tenon joint in comparison to a basic butt joint in resisting a twisting motion, applying the concept to the potential design of the Ark.

### MATERIALS

- Sharp knife or box cutter
- Styrofoam:
  - \* 4 blocks roughly 4x4x12 inches in size
  - \* 4 blocks roughly 6x6x3 inches
- Glue
- Images of a basic butt joint and a mortise and tenon joint (e.g., [https://www.thesprucecrafts.com/thmb/oY7yOmYbEFU\\_3xsf8pdoDKOammI=/6000x4000/filters:fill\(auto,1\)/wood-joinery-types-3536631-v3-5b9827b84cedfd002536486c.png](https://www.thesprucecrafts.com/thmb/oY7yOmYbEFU_3xsf8pdoDKOammI=/6000x4000/filters:fill(auto,1)/wood-joinery-types-3536631-v3-5b9827b84cedfd002536486c.png))

### METHODS

1. Make a basic butt joint:
  - Glue one of the 4x4x12 inch blocks to a 6x6x3 inch block, gluing a 4x4 face to a 6x6 face.
  - Repeat with another set.
2. After the glue dries, twist the 4x4x12 inch blocks, assessing how easily the blocks twist.
3. Make a mortise and tenon joint:
  - Use a knife/box cutter to cut a tenon on one of the 4x4 sides of a 4x4x12 inch block.
  - Use a knife/box cutter to cut in the 6x6 face of the 6x6x3 inch block a mortise that matches the tenon from part (a). [Make sure that the mortise is small enough to allow a tight fit for the tenon.]
  - Add glue to the mortise hole and lip and insert the tenon.
  - Repeat with another set.
4. After the glue dries, twist the 4x4x12 inch blocks, assessing how easily the blocks twist relative to the basic butt joints



## RESULTS/DISCUSSION

1. Was one of the joint types more resistant to twisting? If so, which one?
2. Flood critics argue that a wooden vessel as large as the Ark, with extremely long planks, would not be seaworthy because such long planks would be susceptible to twisting, causing leakage.
  - What, exactly, is keeping the long blocks from twisting on each of the joint types? [Hint: on the butt joint, for example, there are two primary things keeping the plank from twisting.]
  - Why, do you suppose, a mortise/tenon joint would be more resistant to twisting than a butt joint?
  - If the tenon was a cylindrical shape instead of a rectangular shape (with the diameter of the cylinder equal to the length of one of the rectangle's sides), would it be expected to be more resistant to twisting? Explain.
3. Is it reasonable to suggest that pre-Flood humans could have known about and made mortise and tenon joints?
  - If so, how could they have known about them?
  - How could they have made them?

