Wood Joints, glues and clamping
pages 120-122, 215-248, 302-303 and joint handouts

TED 126
Spring 2007

Wood Joints

“joints”…this term is used to describe the close securing or fastening together of two or more smooth, even surfaces.

Wood Joints

- The joint to select for each kind of construction depends to some extent on the need for:
  - The strength
  - The appearance
  - The difficulty of fabrication
  - The equipment available

Wood Joints

- Most joints are permanently fastened together with glue and sometimes screws or nails.
Wood Joints

The following are common methods of strengthening joints.
- Dowels
- Splines and Biscuits
- Key
- Glue Blocks
- Corner Blocks

You can put a dowel into butt, miter, lap joints etc. to add strength to the joint.

For a Spline to add strength to a joint, its grain must run across the joint, not parallel to it.

Using thin wood wafers called biscuits can strengthen wood joints by providing more glue bonding area. Biscuit will expand 2X.

You can use a biscuit joiner (also called a plate joiner) to cut precision mating slits in boards for the biscuits.
Wood Joints

The following are common methods of strengthening joints.

- Key

Glue Block - small triangular or square blocks
Corner Blocks - larger than a glue block

Eight basic wood joints

1. Edge
2. Butt
3. Rabbet
4. Dado
5. Miter
6. Lap
7. Mortise and Tenon
8. Dovetail

Eight basic wood joints

- Edge-to-edge:
  - This joint is used when laminating boards together edge-to-edge to obtain a wider piece of wood.
  - Used for table top, desktops and cabinet sides.
Eight basic wood joints

- **Butt**
  - For simple boxes, cases, cheap drawers, frames and chairs.
  - Very weak joint.

Eight basic wood joints

- **Rabbet** - A cut or groove along or near the edge of a piece of wood that allows another piece to fit into it to form a joint. L-shaped groove cut across the edge or end of one piece.
  - For simple boxes, cases, cheap drawers, frames and chairs
    - It is usually reinforced with screws or nails.
    - Rabbet joints are easy to make and moderately strong.
    - They are used chiefly for boxes, drawers, shelving and at the corners of cabinet pieces.
    - Rabbet joints are sometimes made with a dado variation.

Eight basic wood joints

- **Dado** - is a groove cut across the grain.
  - Typically used in making book shelves, drawers, steps, and book cases. This is a strong joint.
  - In very old furniture, a dovetail dado joint is a real work of art because of the time the cabinetmaker had to spend to cut it.

Eight basic wood joints

- **Miter** - the joining pieces are cut at a 45-degree angle and joined to form a right angle.
  - Miters are used for decorative molding and for frames.
  - They are very weak and are often reinforced with dowels, spline, or mechanical fasteners.

**Polygon miters** - cuts at angles of more or less than 45 degrees to form three- to ten-sided objects.
Eight basic wood joints

- **Lap** joints are really a large group of joints in which one side laps over the other.
- A cross-lap joint joins two pieces with flush faces.
- The pieces may cross at any angle.
- Cutting dadoes of equal width and depth on the two pieces so that the face surfaces are flush when they are assembled makes the joint.
- Used for legs of furniture, doors, furniture frames and braces. This joint is strong.

Mortise and Tenon

- One of the most common joints used for joining the rails and legs of tables, chairs and other type of furniture is the **Mortise and Tenon** joint.

Mortise and Tenon

A large range of mortise and tenon joints exist and the most simple of these is shown.

The tenon is the part that fits into the mortise.

A glue is applied before the joint is pushed together.

Clamps are used to hold the joint firmly together, usually for twenty-four hours.

Mortise and Tenon

- The Plain Mortise and Tenon joint (shown below) is very common and is widely used for the joints of tables.
- Although it is quite strong, if enough force is placed on the joint it will eventually break or come lose.
Mortise and Tenon

- The Wedged Mortise and Tenon joint is extremely strong because the tenon passes all the way through the mortise and is wedged at the other side.
- However, the Wedged Mortise and Tenon is more difficult to mark out and cut and requires much more technical skill.

In this example, a piece of dowel rod is drilled through the mortise and the tenon.
- This helps keep the joint together even when it is under great pressure.
- This is used as a joint on chairs and other pieces of furniture so that the joints do not break apart when extra weight is applied.

Eight basic wood joints

- The DOVETAIL JOINT is very strong because of the way the tails and pins are shaped.
- This makes it difficult to pull the joint apart and virtually impossible when glue is added.
- This type of joint is used in box constructions such as draws, jewellery boxes, cabinets and other pieces of furniture where strength is required.
- There are different types of dovetail joint and when cut accurately they are very impressive and attractive.

Finger Joints

- It is ideal for box constructions and is suitable for use with natural woods such as pine and mahogany or even manmade boards such as plywood and MDF.
- The joint is strong especially when used with a good quality glue.
Glues

- **White glue (polyvinyl acetate, or PVA):** PVA glue is a white liquid, usually sold in plastic bottles.
  - It is recommended for use on porous materials – wood, paper, cloth, porous pottery, and nonstructural wood-to-wood bonds.
  - It is not water resistant. Clamping is required for 30 minutes to 1 hour to set the glue; curing time is 18 to 24 hours.

- **Yellow glue (aliphatic resin or carpenters’ glue):**
  - Aliphatic resin glue is a yellow liquid, usually sold in plastic squeeze bottles and often labeled as carpenters’ glue.
  - Yellow glue is very similar to white glue but forms a slightly stronger bond.
  - It is also slightly more water resistant than white glue.
  - Clamping is required for about 30 minutes until the glue sets; curing time is 12 to 18 hours.
  - Yellow glue dries clear but does not accept wood stains.

- **Plastic resin glue (urea formaldehyde):**
  - Plastic resin glue is recommended for laminating layers of wood and for gluing structural joints.
  - It is water resistant but not waterproof and is not recommended for use on outdoor furniture.
  - This glue is resistant to paint and lacquer thinners.
  - Clamping is required for up to 8 hours; curing time is 18 to 24 hours.
Glues

- **Polyurethane glue** is one of the best waterproof glues available, but until recently was not available outside professional circles.
- It is a one-part adhesive that will adhere to wood, metals, stone, ceramics and many plastics.
- Polyurethane glue does not dry like PVA glues, but instead chemically reacts with moisture in the objects being glued or even in the air.

This reaction causes an expansion of the glue, filling voids and giving an exceptionally solid glue joint. If the material is dry, spraying a light mist onto it before gluing accelerates the curing process.

In many ways, polyurethane may be the best wood glue. It both accepts wood stains and sands well in thin coatings, neither of which are true for PVA wood glues.

Most other adhesives act as a sealer on the wood surface. And removing these other adhesives can be difficult because they dry to a “gummy” texture that resists removal from the wood by sanding... the second strong reason to consider trying polyurethane glue for your next project.

Glues

- A problem that can negatively affect joint strength is **inconsistent glue coverage**.
- While this would seem like an easy task to master, remember that different wood species absorb glue at different rates.
- Differences in the consistency within each piece of wood also create **varying absorption rates**.
- The amount of glue necessary to bond two pieces of oak together might be nearly completely absorbed by softer woods such as pine, resulting in a glue-starved joint in the pine that will almost certainly fail.

- **Stronger, safer, easier to clean up and less expensive** than polyurethane glues.
- Allows eight minutes of open time and has an application temperature as low as 47 degrees F.
- One hour clamp time!
- Cleans up with water.
- Does not foam.
- Superior waterproof
Basic Clamping Systems

- Hand Screw or Wooden Parallel Clamps
- Steel Bar or Cabinet Clamps
- Wood Bar Clamps
- Spring Clamps
- C or Carriage Clamps
- Quick, Band, Hinged Clamps
- Miter-and-Corner Clamps

What is a caul?
The end