Bent, tapered laminations 23 June 2007

Resource list:

Best overall: Jere Osgood – FWW #6, Spring 1977 – Pages 35-38
Great overview – good details

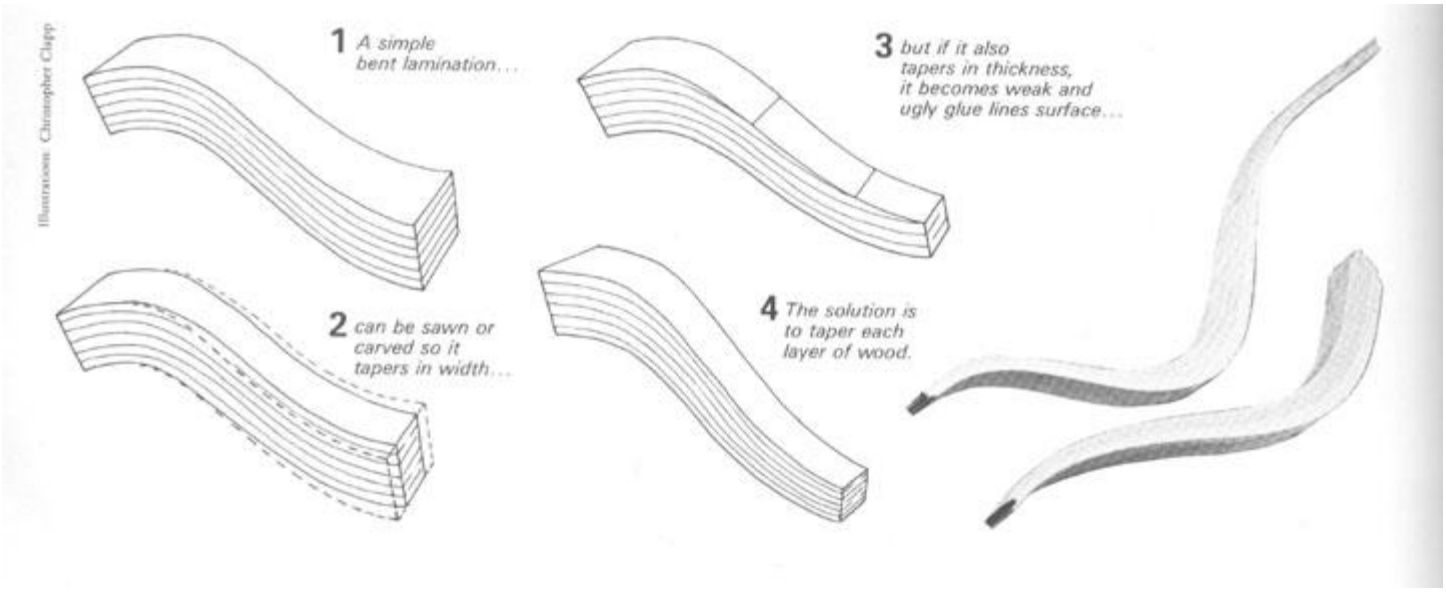
On the New Hampshire Furniture Masters site –
http://www.furnituremasters.org/moreby.cfm?ID=24

The Complete Manual of Wood Bending: Milled, Laminated, and Steambent Work (Paperback)
by Lon Schleining ISBN 0941936546 Linden Publishing (November 1, 2001)

Glues:
Good overview at http://www.joewoodworker.com/veneering/glues.htm
Latest FWW is interesting, but not compelling

My favorite is Unibond 800 – Vacuum Pressing Systems – www.vacupress.com
(don't even think about PVA's like Titebond, etc)

Why laminations?



From Jere Osgood's article above

Simple. Short grain issues, glue line issues, wood conservation issues, design issues all determine how you construct a furniture member. Measure carefully. Add about 0.004 inch per glue line for added thickness.

Wood Selection:
Look at grain structure and also at bending. And make sure that you slice along the correct axis for the design you are looking for. If your slices are parallel to the grain, the glue lines will be almost invisible. If your slices are through the face , you will see a distorted face after tapering and gluing up.

Forest Products Lab has a variety of good resources for you to choose woods. Look at ash – it work well for laminating under almost all conditions http://www.fpl.fs.fed.us/

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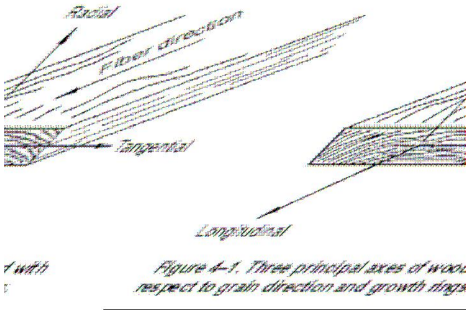

Figure 4–1. Three principal axes of wood with respect to grain direction and growth rings

Clamping:
Don't bother with two-piece forms, they have difficulty providing the needed pressure in the correct places. For a 1 ½ inch thick member, use 3 pieces of ¼ inch TEMPERED hardboard. Can build it up out of thinner pieces if the bend is too severe.
USE GOOD CLAMPS. Minimum recommended is a Bessey Tradesman's clamp. Even this is not strong enough for anything over 2 inches. Try Wexler.

Start clamping in the deepest point for a complex curve (to get it into the deepest part of the curve). For a simple curve, start clamping in the center.

Unibond tricks:

- Always start with cold Unibond. The reaction is exothermic, so the colder it is, the longer you have for working time.
- Always measure accurately – use a postal scale, and figure out your usage based on experience. I use 6 ounces of liquid (weighed) with 0.6 ounces of catalyst for 2 legs about 5 feet long.
- After adding the catalyst and mixing it well, LET IT SIT FOR 5 MINUTES. The reduces the lumps and gets the catalyst evenly dispersed.
- Like epoxy, it lasts longer without setting if the mixture is in a wide flat pan. Deeper pan = faster setup.
- Always roll it onto both surfaces. Very light coats, but both surfaces must be fully wetted before assembly. 3 or 4 inch short nap or rubber rollers work well.
- Cleanup quickly with water – always use paper under your work – and gloves. This stuff is really annoying if you let it cure on your skin. It takes days for it to wear off.
- The stuff drips. Let it drip. Just don't let it drip onto your bench!
- NOTE: This stuff turns birdseye maple veneers yellow – watch it if you are using maples.

After gluing:
Do not use edge tools. And be careful of your hands. It is very sharp, the cuts are painful, but not as painful as having to sharpen your jointer blades.
Sand one edge down (edge sander or belt sander) and then cut the second edge off on the saw. CAFEFULLY.

Re-mark all your centerlines and mark the bottom leg cut on the fixture. Then it is easy to re-orient this on the fixtures. Cut your flats, then your 45 degree angles (or whatever you are doing)