DOES GLUE AFFECT CASTING?

Comparison of three common glues used by bamboo rodmakers

Glues selected for comparison

- EPON
  - EPON Resin 828 / EPIKURE 3140 Mixed 3 resign to 1.8 curing agent
  - www.miller-stephenson.com
- TiteBond III
  - Purchased from local hardware store
- Unibond 800 UREA Adhesive
  - Mixed DI water with 10% Ammonium Chloride Crystals
  - Mixed 20g resin with 2g Ammonium Chloride solution
  - www.nelsonpaint.com

Rods used for comparison

- Taper was provided by Scott Grady
  - Scott calls this his “grinned”
  - Taper originally was given out by AJ Thramer
- 4’ 4” one piece 4 weight
- 5 strips in each rod came from the same culm and machined on CNC
- 1 strip in each rod came from alternate culm and hand planed
- All Strips were Ammonia toned
- Each rod was finished using hand wipe finish
- Each rod was wrapped with same thread and wrapping finished with Helmsman
- Cork glued on each rod using TB II

Process notes

- EPON – Rod One
  - Preheated strips with heat gun
  - Rolled joint after binding
    - Epoxy seems to act like lubricant and makes assy of the strips into a joint very easy and some work themselves out as you bind
  - Wiped with rag damp with DNA after binding
  - Sprinkled with Talc
  - Hung 24 hours at 65F
  - String remove and joint scraped
  - Heat Set at 195F for 2 hours and pulled strings

Process notes

- TiteBond III – Rod Two
  - Spread glue on strips with tooth brush
    - Glue seems to skim very quickly after spreading
  - Rolled joint after binding
    - Did not transfer much glue to paper
  - Wiped joint with rag damped with water
  - Hung 15 hours at 65F then 15 hours at 85F and pulled string
    - String maintained integrity, well bonded on the rod, most difficult to remove dried glue between the three glues

Process Notes

- Unibond 800 – Rod Three
  - Wiped strips with damp rag several times until they were visible moist
  - Let strips set for 15 min
  - Mixed glue
    - Had to look up on the internet on how to open the can
    - Has a distinct chemical type odor that was similar to Copenhagen snuff when Ammonium Chloride solution was added
    - Light creamy color but spreads very thin and clear
  - Spread on strips with toothbrush
    - Spreads very thin and easy
    - Glue skins very quickly and becomes candy sticky
- Hung 12 hours at 85F
- Heat set at 175 for 1 hour and pulled string
  - String was brittle and dried glue scraped “chipped” off easily

Moisture content in wood

- Unibond 800
  - Requires 7% - 15% Moisture Content

MOISTURE CONTENT VS RELATIVE HUMIDITY

Relative Humidity	Moisture Content
0%	0%
25%	5%
50%	9%
75%	14%
99%	23-30%

Share this chart with your customers so they'll understand what moisture meter readings mean (http://www.forestprod.org/cdromdemo/wd/wd4.html)

FIG 3 ABOVE: According to test data from WindsorONE, for every 4% change in moisture content, flat-grain boards with two layers of primer will change size approximately 1%. That means 1/16 in. in a 1x6 board!

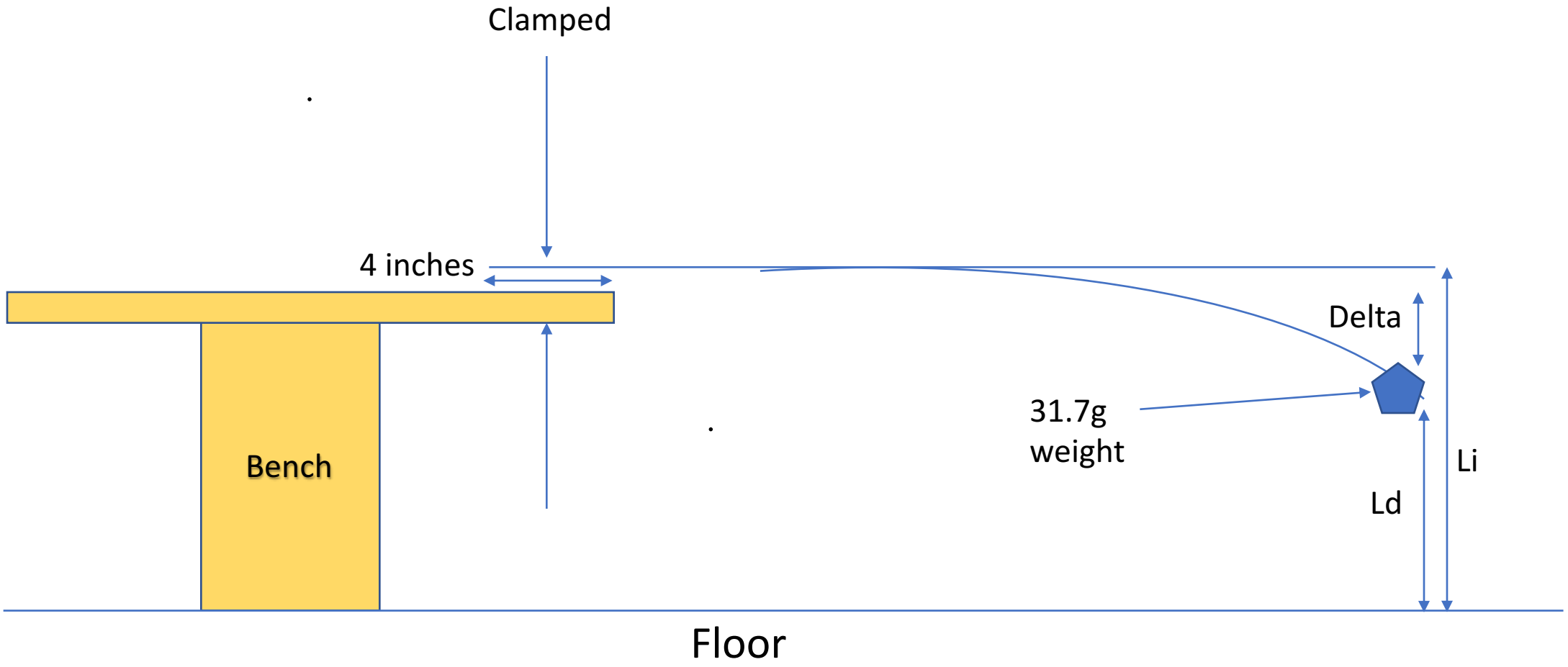
Clamping and Cure Temperature

- Unibond 800
  - Directions indicate that there can be some delay between applying and clamping
    - 30 min @ 70F
  - Minimum clamp time depends on temp
    - 1 hour @ 90F
    - 3 hour @ 70F
  - “Do not use Unibond 800 below 70F as Proper Curing Will Not Take Place”

Rod Building Glues

Glue	Pros	Cons
TiteBond III	- Availability - Ready to Use - Water Cleanup	- Quick to Skin When Spread - Difficult to remove from Cane when Dry if not wiped with damp rag right away
Unibond 800	- Easy to remove from Cane when Dry - Water Cleanup - Can be set in 1 hour with Heat - Easiest to Spread	- Quick to Tack When Spread - Shelf-Life - Moisture/Temp Sensitivity - Precision Mixing - Somewhat Hazardous - Sensitivity to Process (Temp & Moisture Cont.)
Epon	- Shelf-Life - Very Reliable - Long Working Time - Can Use Heat Set or Not - Easy to Clean With Correct Steps	- DNA Cleanup - Mildly Hazardous - Requires Mixing - Thicker and requires heat to spread easily but thins quickly

Static Deflection Test



Static Test Results

Rod	Li initial (in)	Ld deflected (in)	Delta = Li - Ld
1 - Epon	33.75 33.625 33.75	20.25 20.25 20.25	13.50 13.375 13.50
		Ave	13.46
2 – Unibond 800	33.125 33.00 33.00	19.75 19.50 19.75	13.375 13.50 13.25
		Ave	13.375
3 – TiteBond III	32.5 32.5 32.5	19.25 19.25 19.25	13.25 13.25 13.25
		Ave	13.25

- Measurement error was at least 0.125 inch
- All 3 measurements we taken in same strip orientation
- No care was taken to verify spine direction