Don't hide from hide glues! They're great!

Prepared by D. Rathwell for The Looth Group

History:

These glues date back centuries. Their usage has been found in ancient Egyptian furniture and Japanese art (for preservation). In Japan, the manufacture of *nikawa* (essentially animal protein glues) was a trade designated to those whose family had been removed, socially, from the upper class. This is because trades that dealt in death were considered tainted to the Buddhist and Shintoistic ways of life. I imagine it was peoples of similar standing manufacturing these glues in southern Africa. In North and South America, the indigenous peoples also figured out methods of hide glue manufacture and used it as a protective and water-resistant coating for boats and other tools.

In our world of lutherie, it had been the primary adhesive for hundreds of years until the development of industrial glues in the 1930's. C.F Martin & Co. continued its use until the mid 1960's when they relocated from their North Street manufacturing facility. Today, it remains the primary glue in the lutherie of bowed instruments.

Manufacture:

There isn't a single standard for the manufacture of these glues – nikawa for instance has a certain selective tradition and depending on what animal protein and/or by-product is being utilized in the preparation of the adhesive, the process can vary. The following is the general method of preparation for the traditional hide glue used in N. America; that is glue made from the hides of cattle, which is the choice material due to the world-wide usage for leathers and consumption of beef:

- Select pieces of irregular shape (unusable for leather)
- Wash to remove dirt etc.
- Soak in calcium-hydroxide solution for 2-3 months
- Wash again to remove hair and Ca(OH)2 residue
- Neutralize with acid, drain, wash again and drain again

- Process of extraction – add water, heat (roughly 115°f) for 2-4hrs
- Drain the dilute glue solution, evaporate, refrigerate, dry, grind
- Repeat above process 2-3 additional times, increasing heat approximately 22.5° each time

Grading:

Viscosity and gel strength are the main components when considering the grade of glues, followed by the millipoise. The processes for these valuations are as follows:

- A 12.5% solution of hide glue, employing a 15± 0.01g of commercially dry glue with 105± 0.2g of distilled water at 25°±2°C using a 150ml test bottle

Viscosity is determined by timing outflow of 100ml of glue solution at 60°C from a calibrated glass pipette under strictly controlled and monitored conditions.

Millipoise value is reference to time of outflow in seconds and the constants of the calibrated pipette.

Gel/jelly/bloom value is measured in bloom grams. Bloom or gram is what we most often hear when considering the "strength" of our hide glue. It is obtained by subjecting the viscosity sample to controlled gelation in a water bath maintained at 10°± 0.1°C for 17hrs. Measurement of the force in grams required to depress the surface of the glue jelly 4mm, by a mechanically loaded plunger approximately .5" in diameter, using the Bloom gelometer

Table of Hide Glue Grades used in Lutherie:

Standard Mid-Point Grams	Range Grams	Standard Millipoise Value	Range Millipoise Value	Peter Cooper Grade Designation
379	363-394	131	125-137	A Extra
347	331-362	121	113-124	1 Extra
315	299-330	111	102-112	1 Extra Special
283	267-298	101	92-101	No.1
251	237-266	92	83-91	1XM
222	207-236	82	75-82	1X
192	178-206	72	67-74	1-1/4

Preparation of Raw Hide Glue(s):

- Use clean equipment!
- Weigh glue and water
- Soak in clean, cold distilled water
    - Ground glue(s) will require 30-45mins to soak. Coarser ground glues will require 1-2hrs to thoroughly swell. Flake glues will take anywhere from 2-8hrs dependent on thickness of the flake
- Pour dry glue into water
- Use gentle heat

Glue Grade Selection:

1. For maximum strength and shock resistance, utilize bloom strength grades of 315-379 grams
2. For average strength and shock resistance, utilize bloom strength grades of 192-315 grams
3. For non-critical strength and shock resistance, utilize bloom strength grades of 135-192 grams

Typical Water to Glue Ratios:

Bloom Grade	Porous Wood (Water:Glue)	Non-Porous Wood (Water:Glue)
379	3 : 1	3-¼ :1
347	2-¾ : 1	3 : 1
315	2-½ : 1	2-¾ : 1
283	2-¼ : 1	2-½ : 1
251	2-¼ : 1	2-½ : 1
222	2 : 1	2-¼ : 1
192	1-¾ : 1	2 : 1

Tips and Tricks:

- Extend open time
    - Adding upwards of 15% salt (or urea) ***by weight*** will extend working time. For a 251-bloom strength glue prepared as suggested above, the open time will increase from 1min to approximately 5mins.
- Improve adhesion
    - Replace 5% of water ***by weight*** with vinegar (white)
- Improve flexibility
    - Adding upwards of 15% glycerin ***by weight*** will increase flexibility

Recipes for Fresh Liquid Hide Glue:

Mixture ratios by weight

Glue Strength	Water	Glue	Salt (or urea)
283-315	20 parts	10 parts	2 parts
192	16 parts	10 parts	3 parts

Dry glue is swollen in cold water until soft in accordance with earlier above suggestions. It is then cooked in the traditional method to no greater than 145°f and kept at this temperature for at least 1hr. When cooled to room temperature, it will remain viscus (to a certain extent) and is suitable as a "liquid hide glue".