

VALLEY WOODWORKERS--HOT HIDE GLUE INFORMATION

Don Parker, June 8, 2023¹

I. WHAT IS HOT HIDE GLUE?

Hot hide glue is gelatin, derived from the collagen of animal skins. The type of gelatin that is used to make Jello allegedly comes from pig skin, but the type that we use for woodworking comes from cow skin.

There are other animal protein glues that are used for woodworking. For instance, there is rabbit glue, and there is fish glue. Each has its own properties. The information I present here is limited to the type of animal protein glue that comes from cow skin.

Hide glue comes to the end user in dry pellet form, which has an essentially unlimited shelf life, as long as it is kept cool and dry. There are three "states of being" of the glue that are of concern to the woodworker:

1. Dry solid
2. Gel (water added to the dry solid)
3. Liquid (heat applied to the gel)

Hot hide glue only works as glue when it is in the liquid state. In short, you have to spread the glue on the parts while it is liquid, and position the parts and any clamps while the glue remains liquid. If the glue is allowed to gel before the parts are positioned and clamped together, then the glue simply is not glue. It is Jello. You will need to start over if it gels before the parts are positioned and clamped. So, it is really important to work fast.

There are different grades of hide glue. The grades are differentiated by a peculiar measure called "gram strength." It is a number that represents the number of grams of mass that must be applied to a plunger of a specific size in order to depress hide glue in its gel state to a specific depth. As I said, it is a peculiar measure.

The type of hot hide glue that I regularly use is 192 gram strength, and that is what I recommend other woodworkers use. It is plenty strong for anything a normal woodworking project could require.

There are higher grades available to woodworkers; 251 gram strength is a common one. The virtue of a higher gram strength is that it is stronger. The downside is that it gels faster, so you have to move faster. Given the fact that 192 gram strength is plenty strong, I see no reason to experiment with 251 (or higher) gram strength hide glue until you face a specific challenge that might require a stronger glue.

¹ Please note that this is **not** a scholarly article. So, I have not cited sources or authorities. But, it should be assumed that I drew this information from multiple sources.

Here are a few places where you can buy dry glue:

Woodcraft	Lee Valley Tools
Klingspor	Stewart MacDonald
Highland Woodworking	Amazon
Homestead Finishing Products	Bjorn Hide Glue
Tools for Working Wood	

The big secret: It is all made in the same plant here in the US: Milligan & Higgins. So, just buy it where it is least expensive and most convenient.

II. WHAT ARE HOT HIDE GLUE'S GOOD/BAD ATTRIBUTES?

Good Attributes:

- Won't slide or creep, if used without additives
- Very, very strong
- Does not stain wood
- Cleans up with water
- Behaves very well under finish
- Sands well, once fully dry
- Nontoxic
- High heat resistance
- New glue sticks to old glue
- Great for filling in around inlay, when mixed with urea and sawdust
- Works pretty well as a pore filler
- Low or high viscosity, depending on need
- Brittle or flexible, depending on need
- Can sometimes use rub joints
- Very good reversibility, if desired
- Best thing for a glue sizing

Bad Attributes:

- Just overall more work to use than PVA/AR glue (i.e., yellow woodworking glue)
- It must be liquid to work as glue; short working time
- Temperamental; you need to do things right or it simply isn't glue
- Attractive to bacteria
- It spoils
- Doesn't fill huge gaps well; the parts need to fit together
- It can be overcooked, and thereby weakened
- It swells the parts
- When the joint fails, it sometimes just pops off
- Needs both high heat and some moisture to release

III. WHAT ARE SOME USES FOR HOT HIDE GLUE TODAY?

- Envelopes and stamps
- Cardboard boxes, especially for food packaging
- Some types of plywood
- Match heads
- Garnet sandpaper
- Book binding
- Glass chipping
- Hammer veneering
- Period appropriate restoration
- And, of course, fine musical instruments!

IV. HOW DO YOU USE HOT HIDE GLUE?

1. Making the gel:

A fairly traditional mixture ratio of water to dry glue is 2 to 1, by weight. However, I find that ratio to be pretty runny. I prefer a thicker glue most of the time. So, I use a 1.6-1.8 parts water to 1 part glue ratio. Runny glue can be useful for some things, but not for general use.

I use a cheap digital scale to measure my glue and water.

Before mixing the dry glue and the water, however, you need to know how you are going to heat it up. Why? Because you should not mix the dry glue and the water together in anything other than the container in which it will be heated. The mixture is too sticky to transfer from one container to another.

The gel is ready to be heated when all of the water is soaked into the dry glue, and you have a gel that looks like fish eggs or tapioca.

2. Heating the gel to a liquid state:

The goal is to get the gel heated to, and remain at, 140F. The glue will be liquid at somewhat lower temperatures than that. However, below that temperature, the liquid cools to a gel faster, leaving less working time. Above 140F, the glue starts to deteriorate faster than you want (i.e., it can be overheated). 145F is OK. 150F is probably OK, for short periods. 140F strikes a good balance; it maximizes working time and minimizes overheating risk.

A traditional way of heating hide glue is to use a double boiler of some sort. An old style "glue pot" has a small container (which holds the glue) suspended in a larger container (which holds just water), and the whole thing is heated over some sort of heat source that can be adjusted. I use a double boiler glue pot made by Musicaravan, now sold by Luthiers Mercantile International.

For a heat source, any electric hot plate will do. I use a student model laboratory hot plate, but I bought mine used. They are expensive new. It is probably overkill (unless you find a used one at a good price), so just buy a regular hot plate.

Other folks use an electric glue pot made by Hold Heet, and sold by various retailers. I think Covid halted production, so these might be hard to get.

A low cost way to heat the glue is to just buy a regular hot plate, put a regular pot of water (shallow, not full) on the hot plate, and put the glue in a glass jar in the hot water. If it floats, use less water or put marbles or stainless steel bolts in the glass jar to weigh it down.

You need to control the temperature of the glue, and in order to control it, you need to know what the temperature actually is. A meat thermometer works fine. Better thermometers (lab thermometers, electronic thermometers) are more accurate.

Once the glue is liquid, and maintains a temperature around 140F, it is ready to use as glue!

3. Performing a dry run:

If you plan to clamp the parts you are gluing, it is important to do a dry run, then take it apart and keep everything at hand so that you can get the parts clamped up as fast as possible after you spread the glue.

4. Pre-heating the parts:

Sometimes I like to heat the parts I am about to glue, because that helps slow down the gelling of the glue. A heat gun is ideal for this task. A hair dryer will work, too, but it is not as efficient. Keep the heat gun moving! You don't want to scorch your wood.

Once you heat the parts, put the heat gun down somewhere safe, then spread the glue on the parts.

5. Spreading the glue and clamping the parts:

You can use any brush you want to spread the glue. This is a major spot where working with PVA/AR glue, and then moving to hot hide glue, can require some "retraining." PVA/AR glue users like to squirt glue out of a bottle, then spread it with a finger. With hot hide glue, you will make a huge mess if you use a finger to spread it! You dip the brush in the glue pot, move the brush to the workpiece, and spread the glue on the workpiece with the brush. No fingers involved.

After the glue is spread, you position the parts and apply the clamps.

6. Cleaning up squeeze-out:

After a few minutes, the squeeze out will be like Jello (since that is, in fact, what it is). That is an ideal time to scrape as much of the Jello off as you can reach with the clamps in place. I use a few different tools for this. One tool is a pointy wooden stick. Another is a blunted chisel.

After removing the bulk of the glue, a wet rag (wet with hot water) will wash the rest of the squeeze-out away.

If you wait too long, the glue will be so dry that you are better off waiting until it is completely dry, then scraping and sanding it off. However, you really want to avoid leaving large drips of glue on the wood until it fully dries. Completely dry, large amounts of hot hide glue stuck to wood is ridiculously difficult to remove, short of power sanding it off, and you can tend to remove some wood along with it. The glue is that strong.

7. Removing the clamps:

When you remove the clamps really depends on whether you used glue with additives or just straight hot hide glue, and how stressed the joint is without clamps. With straight hot hide glue, and no stress on the joint, you barely need to leave the clamps on for any length of time at all. A half hour is enough. If you added something to lengthen the pre-gel time, and/or the joint is stressed, leave the clamps on overnight.

V. WHAT ARE SOME WAYS OF MAKING HOT HIDE GLUE EASIER TO WORK WITH?

1. Good normal process

I have already mentioned doing a dry run, reversing the glue-up procedure, and heating the parts right before gluing. Following that pattern gives the woodworker a huge advantage. Otherwise, you are really fighting the clock, and losing that fight is a huge hassle. You have to scrape off the glue (now Jello), and either heat the wood to get rid of the moisture left by the glue or wait for it to dry and then sand it back.

2. Urea

My secret weapon to extend working time is to add urea to the glue. Salt can also be used, but I have only worked with urea, so I cannot vouch for the use of salt. You will have to consult the internet if you want to experiment with salt.

If you add urea that amounts to 20% of the dry weight of the glue used to make your batch of glue, you have just made the exact equivalent of Old Brown Glue. It will stay liquid at room temperature. Like Old Brown Glue, it is highly viscous at room temperature, and it works a lot better if it is heated. But you essentially do away with the gel state of the glue. You go straight from liquid to dry (via evaporation of the water in the glue).

The downsides of adding urea:

- You don't have the gel state of the glue helping to keep the parts together, so clamping is necessary (no rub joints)
- The drying time is longer
- The glue has a little more of a tendency to be flexible when fully dry, more like PVA/AR glue
- You weaken the glue a little

A good compromise is to add just a little urea (like 5-10% of the dry weight of the glue used to make the batch) to somewhat extend the open time. The gel state is delayed, but not eliminated. This really accomplishes all the good things about adding urea, but avoids the downsides.

3. Cooking, bottling and freezing

Another way to make hot hide glue more like PVA/AR glue, at least in terms of process, is to make a large batch, store it in small squeeze bottles, and freeze the bottles. Then when you need glue, you just put a bottle in a hot water bath and get it up to 140F.

This is really not a bad way to use hot hide glue, and lots of people do it. However, I find there to be some downsides. First, it is harder to tailor the batch to what you need in the moment. I like to make thicker glue when I need that, and thinner glue when I need that. You can add water to a thawed bottle of hide glue to make it thinner, but it is harder to add dry glue to make it thicker. And adding urea is not easy when the bottle is that small. Also, like with any food product, repeated freezing and thawing can take its toll on hot hide glue. I have experienced glue failures due (in my estimation) to using glue that had been through too many freeze/thaw cycles.

4. Commercially available bottled hide glue (aka liquid hide glue)

There are two main bottled versions of hide glue that are commercially available: Franklin Titebond Liquid Hide Glue and Old Brown Glue.

I really don't work with Franklin Titebond Liquid Hide Glue, but there are folks I trust who use it with success. My concern with Franklin is that it has a number of additives other than urea, and I have heard mixed reports about using it. However, as I said, there are people I trust who rely on it.

I can recommend Old Brown Glue, because I know exactly what is in it: Hot hide glue and urea. There are no other additives. Of course, there are a few downsides to this product, too. First, keep an eye on the expiration date. You can mostly ignore the expiration dates on many products (including PVA/AR glues), but don't ignore this expiration date. It matters. Second, it really does work better when you heat it up. It even recommends that on the label. Third, there is no gel state, so you have to clamp the parts and leave more time for the glue to dry than if you use regular hot hide glue. Fourth, compared to buying dry glue and mixing it yourself, Old Brown Glue is very expensive.