Working efficiently with hot glue

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USING TRADITIONAL HOT GLUE is a tricky process of balancing working time against bond strength. You only have a limited amount of time to work before the glue turns from a liquid to a gel. Premature gelling might result in a joint with a gap. Not only does the gap look bad, but hot glue is a very poor gap filler and loses strength as the glue layer becomes thicker. If a joint has a gap, or the glue gels before parts are properly aligned, you might need to take the joint apart and start all over again. Adding water to the glue can extend your working time, but too much dilution will weaken the glue joint.

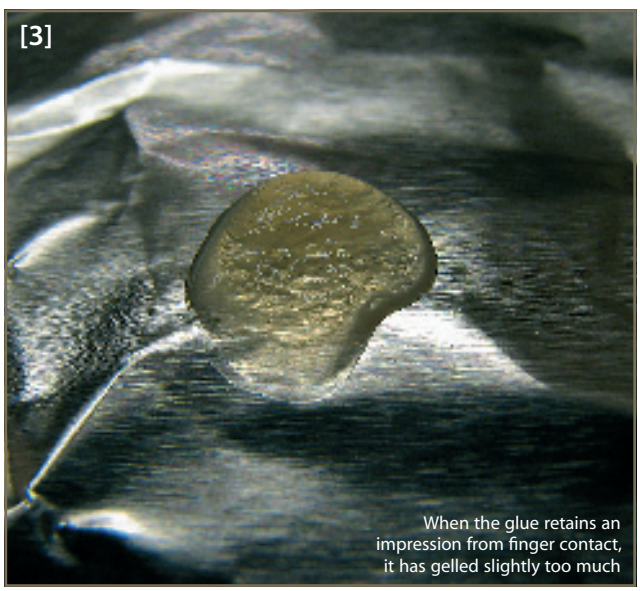
I used to try to determine glue strength and working time by observing the viscosity or thickness of the liquid, either by looking at the glue as it dripped off the brush, or by rubbing it between my finger and thumb. But these methods weren't reliable enough. There were occasions when I couldn't get the clamps on in time, and other times when I knew I had sacrificed bond strength by diluting excessively. I think the best way to find the ideal balance between strength, dilution and gelling time reliably and repeatedly is to time how long the glue takes to gel immediately before using it. Here I explain how I judge the gelling times and also suggest alternatives to applying glue with a brush.

Placing a drop of glue on foil

ALL PHOTOS DAVID BURGESS

[1] First I place a sample drop of glue on a piece of aluminium foil. Then I probe the drop with a finger periodically, so I can easily see when it begins to change from a liquid to a gel. If I'm using a strong glue concentration that will gel in about 30 seconds, I'll just count the seconds and wait. With more dilute glues – the kind I would use for gluing on a top, for example – the gelling process takes closer to three minutes. For these glues I use a timer with an alarm, so I can be doing and thinking about other things while the timer is counting down.


[2]
Testing the glue: here it is still behaving as a liquid


[3]
When the glue retains an impression from finger contact, it has gelled slightly too much


[4]
An applicator combining a brush and an eye dropper

[2] & **[3]** In the first picture, the glue is still behaving as a liquid. By the second picture, the glue retains an impression from finger contact, and isn't drawn up into a cone shape with the finger. I actually don't wait until the glue has gelled this much; instead, I use an in-between phase that I was unable to capture in a still photo. It can be observed in the way the glue moves when drawing the finger away. I use this middle phase because it is of short duration, and therefore provides the most accurate results. It only takes a few times to get the hang of judging this phase.

As long as you continue using the same kind of glue from the same source, this method is a consistent and reliable way of achieving repeatable strength and working time.

Based on a 315g-strength glue, here is a guide to the gelling times I use for various making operations at about 70 degrees Fahrenheit and 40–60 per cent humidity:

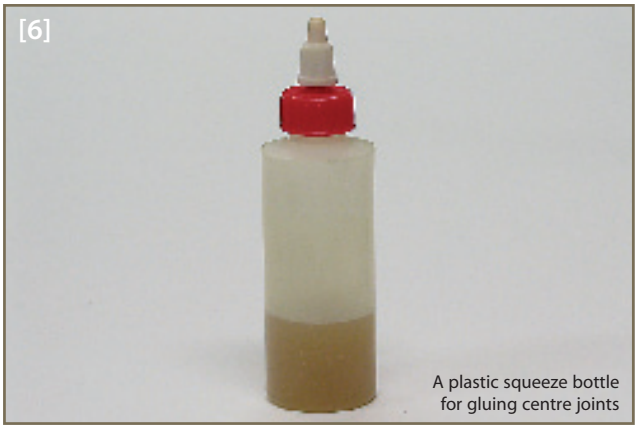
Fingerboards: 60–80 seconds
Linings: 40 seconds
Ribs to blocks: 40 seconds
Tops and backs to ribs: 180 seconds
Necks: 60 seconds
Bass-bars, violin: 60 seconds
Bass-bars, cello: 70 seconds

These are just general guidelines. You'll need to come up with your own values based on the particular glue you use, how fast you work, and the working environment.

When performing convoluted repair procedures, there's a handy way to use a thicker, stronger glue and still have extended working time. Because gelling time at a particular glue concentration is temperature-dependent, and the glue will also become thicker from moisture loss and will begin to dry while you are working, you can set up a gluing room with elevated temperature and humidity to slow down the process. You can easily set up in a toilet or small bathroom. All that's needed is a cheap steam-type vaporizer and a space heater. Ideally, you would monitor the temperature and humidity so that you can get repeatable results. But if you get the room to the point where it feels steamy and uncomfortable, you will have vastly extended the working time. Even a ten-degree increase in temperature will make a very noticeable difference.

[4] With speed always a consideration, I've found that there can be better ways to apply glue than the commonly used brush. There are many times, particularly in making, when a brush won't hold enough glue for the whole gluing procedure, so applying sufficient glue can require several trips between the work and the glue container. This takes more time, and with each trip, you have one more opportunity to drip glue where you don't want it. To minimise this, I often use an eye dropper with a brush attached to the end. The brush is not always needed, but is handy for spreading the glue evenly over the surface. I made this applicator by cutting the tip from a small artist's brush, wrapping the brush on to the eye dropper with thread, and then soaking the thread with super glue. This may not sound like a secure method of attachment, but the applicator has held up well for years. I use it when attaching tops and backs to the rib assembly, and when gluing violin bass-bars and necks.

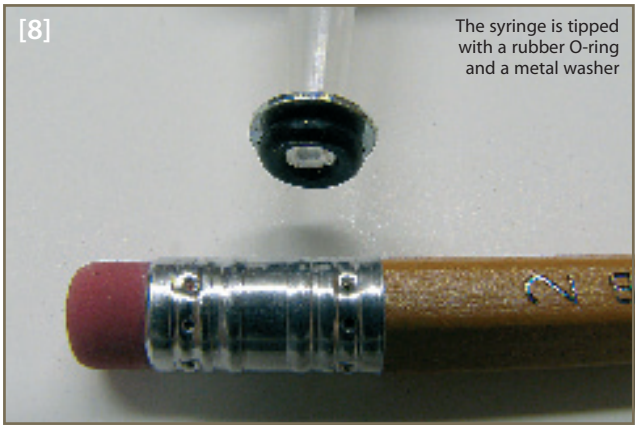
[5] For a higher glue capacity, there are two applicators I use. One is a syringe. I use this most often for applying glue to the purfling groove. For other uses, such as gluing cello bass-bars and necks, a brush can be attached to the end for distribution if needed, as was done with the eye dropper.



[6] The largest applicator I use is a plastic squeeze bottle. I only use this for centre joints. I squeeze the glue on to the surface and spread it with a finger. On a cello centre joint, this takes less than ten seconds. The plastic of the bottle is sufficiently heat-resistant to go directly into the glue pot.

[7] & **[8]** My most interesting applicator is a high-pressure glue injector for injecting glue into cracks that can't be forced open very far. This is made from one of the plastic syringes mentioned above, with a shoulder glued to the stem (in this case, a tiny metal washer), and a rubber O-ring on the end, which sits against the shoulder. The O-ring will make a tight seal against the instrument, meaning you can use very high glue pressure to force the glue quickly into tight spaces.

Some practice is required to learn how much pressure against the instrument is needed to avoid leakage, and how to keep the O-ring from slipping on the work once it has become slick with glue.



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