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Adhesives

KEYWORDS

adhesion
adhesives
assembly

contact
PVA

superglues
synthetic

Adhesives or glues are used to bond wood and other materials together. They also reinforce joints in wood. Glues are available in a wide range of types to suit many jobs and materials. It is important to select the glue that will work best for your project.

The chemicals used to make some glues can be dangerous, so always read and follow the manufacturer's instructions. There are some general terms to know when using adhesives.



Shelf life – ‘best before’ date

Some different adhesives

The shelf life is the period of time before which the glue must be used. It is like the ‘best before’ date and is recommended by the manufacturer. Some adhesives will keep for a long time in their sealed containers. This time reduces when the container is opened.

Pot life

Some adhesives must be mixed before use, or a small amount is poured into a container that is used during the assembly (putting together) of a project. The pot life of an adhesive is the time it remains usable in a pot, before it starts to set. Pot life is also known as open assembly time.

Closed assembly time

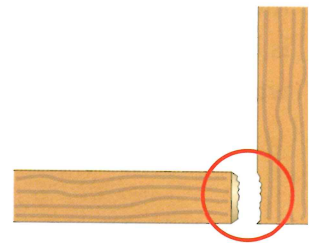
Closed assembly time is the time period that you have to adjust freshly glued pieces to get them square, or to arrange cramps before the glue starts to set. With **contact adhesives** and **superglues**, this time is very short.

HOW AN ADHESIVE WORKS

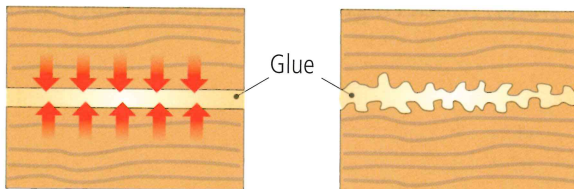
Most adhesives need to be held in cramps for some time while the glue hardens or sets. Once the glue has set, the bond can be stronger than the wood itself. There is an experiment to test this. Try to pull apart a glue joint – the timber should break rather than the glue.

Adhesives hold wood together in two basic ways:

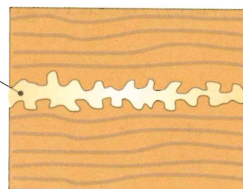
- 1 **Specific adhesion:** This is the holding power of the glue itself, holding the surfaces together.
- 2 **Mechanical adhesion:** The glue also gets into the cracks and crevices of the material giving a key effect that helps to hold the pieces together.



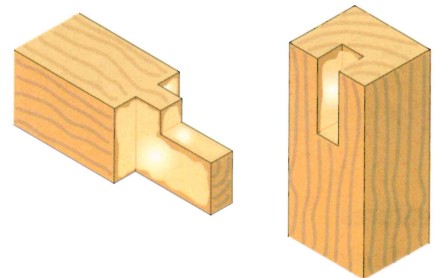
Adhesive can be stronger than



Specific adhesion
Glue attracts (sucks) the two surfaces together



Mechanical adhesion
Glue fills gaps and pores to form a key which holds the pieces together



Specific adhesion and mechanical adhesion

The larger the glue area the better

The surfaces must be in contact for the glue to work properly. In a joint, the area of the surfaces in contact is important, because the greater the glue area, the stronger the joint.

Adhesives set in a number of ways:

- When a solvent evaporates
- Some need heat to allow the glue to set
- Some need pressure (cramps) during the setting
- Some need to be combined with a catalyst or hardener, which causes a chemical reaction allowing the glue to set

TYPES OF ADHESIVE

The glue most widely used in schools is PVA (polyvinyl acetate) glue, but there are other types of adhesive.

Protein adhesives

Scotch glue

Often called animal or pearl glue, Scotch glue is made from the bones and hides of animals. Hides and bones are boiled and the liquid is drained off. It cools to a jelly and hardens, which is broken up into small pieces or refined into small beads, which give the pearl glue its name. It was mainly used in veneering, and is used for furniture restoration today.



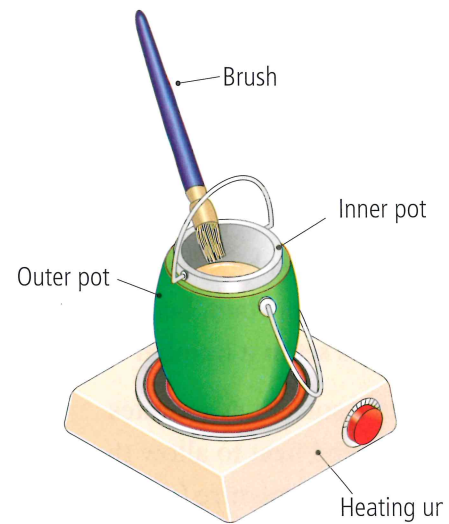
Scotch glue pearls

To prepare the adhesive, soak the pearls in water overnight and then place them into a special glue pot. The glue heats in the inner pot, which prevents the mixture from burning (rather like melting chocolate in a bowl over a saucepan of hot water).

Stir the glue until it melts. If the mixture is too thick, add more water. Modern glue pots are electrically heated.

Features

- Scotch glue is water soluble (dissolves in water)
- It has a strong smell
- It has a long shelf life
- Not very strong
- Not heat resistant
- Heating the bonded pieces will break the bond
- Takes time and a lot of preparation
- Used in veneering and furniture restoration



Heated glue pot

Casein glue

Casein glue is made from skimmed milk mixed with other chemicals. Casein glue is both water-resistant and strong.

To prepare the glue, mix the white powder with water in a non-metallic container. Stir until it is a thick creamy consistency. Then leave to stand for 15 minutes before use.

Features

- Very strong glue
- Has a long shelf life
- Resists water and heat
- It is easy to mix
- It has to be mixed before use
- It stains certain woods
- Must be used quickly once mixed

Synthetic resin adhesives

PVA (polyvinyl acetate)

There are many synthetic adhesives made from various chemical compounds. They have advantages over glues made from natural products. PVA glue is a synthetic adhesive and it is the glue most common in school workshops. It is a thick white creamy liquid.

Pieces glued with PVA need to be cramped to keep them in place.

Features

- PVA is water soluble
- water-resistant type available
- Ready to use from the container
- Sets in 4–12 hours (usually left overnight)

Urea formaldehyde resin

Urea formaldehyde resins are very strong glues. They are used for laminated work and in the making of plywood and other manufactured boards. They have very good water resistance. Care must be taken when using these glues, as they can cause damage to the skin.

Epoxy resin

Epoxy resin glues and hardeners come in the form of thick, stiff creams. They have many applications and are especially suitable for bonding non-porous materials, such as metals, glass, wood and plastics. They are usually supplied as two-part adhesives. Care must be taken when using these glues to avoid skin contact.



■ PVA wood adhesive



Features

- They are expensive
- The glue paste and hardener are mixed together
- Very strong glues
- Quick setting glue
- Bond metals, wood, glass and ceramics

Aliphatic resin glues (yellow glue)

Aliphatic resin glue is similar to PVA glue but has advantages over PVA. It is a popular woodworking glue as it gives a strong grip quite quickly and sets faster than PVA and is more water-resistant.



Epoxy resin glue

Superglues (cyanoacrylates)

Superglues are popular glues, which have a wide variety of uses. The glue sets in seconds and forms a very strong bond. These glues are usually sold in small amounts and are expensive. Take care when using superglues as they can be dangerous. Skin can be stuck together or stuck to the piece of work quite quickly, and the bond is difficult to break.



Superglue

Features

- Expensive
- Only small amounts used
- Used for small bonding jobs
- Glue sets in seconds
- Water-resistant
- Harmful – avoid skin contact

Contact adhesives

Contact or impact adhesives are made from natural or synthetic forms of rubber. There are many types available. Contact glue is widely used for veneering and bonding leather and fabric to wood. The glue is applied to both surfaces to be bonded using a spreader. When the surfaces are brought into contact, they stick together at once. Contact glues have a strong smell, so use in a well-ventilated space.

Usually the piece being bonded is larger than needed and the excess is trimmed off when the glue has set. It is available as a spray.

Features

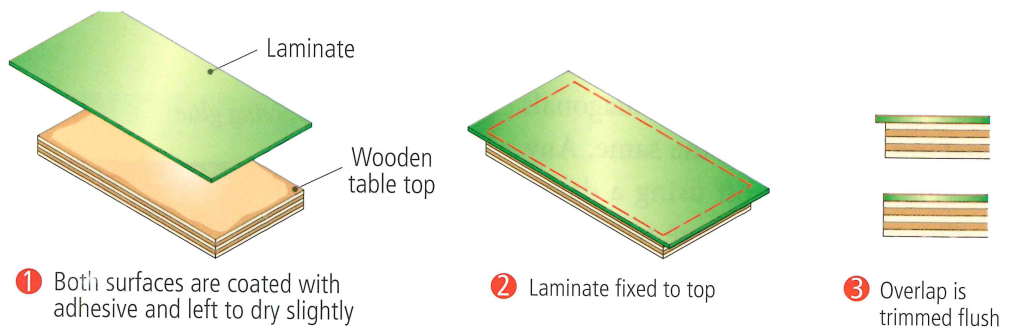
- Bonds on contact
- Very little time to adjust position of pieces



Contact glues

Contact glue is used to bond leather to wood

- Used for veneering
- Solvent-based, harmful if inhaled
- Strong smell
- Avoid skin contact



Gluing a laminate with contact glue

Hot melt glue

Hot melt or thermo glues are designed to be used in a heated glue gun. The glue is available as a stick that is loaded into the glue gun. The trigger of the gun controls the amount of glue released. The glue sets quickly and so it is unsuitable for wood joints. It is good for tacking pieces together.

Take care when using the hot glue and the heated nozzle to avoid burning yourself.

Assembly

As your project comes together ensure you do the assembly correctly. Do not rush it. The glue that you use should be suitable for the job whether inside or outside. Before gluing up, fit all joints dry to make sure they fit.



Hot melt glue gun

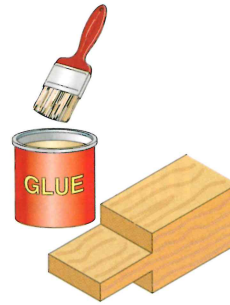


Apply glue evenly and thoroughly to the surfaces of the joints. Cover all the surfaces being bonded, but do not put on too much, as the excess will squeeze out and cause a mess.

Glue may be applied using a small brush, but a spreader is often used with impact adhesive to get a film of even depth on the surfaces to be bonded.

When the joints are glued, they usually need to be held in cramps until the glue sets, although nails and screws can also be used to hold the pieces together. Pieces of wood are used against the work to protect it from being bruised by the pressure of the cramps.

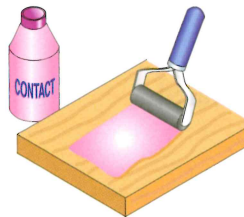
After assembly, the joints are checked for squareness by measuring the diagonals and making sure they are the same. Any excess glue is cleaned off using a damp cloth. This ensures that there will be no stains when a finish is applied.



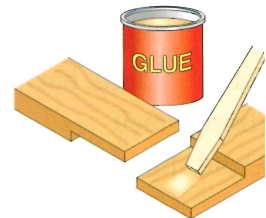
Brush



Spreader



Roller

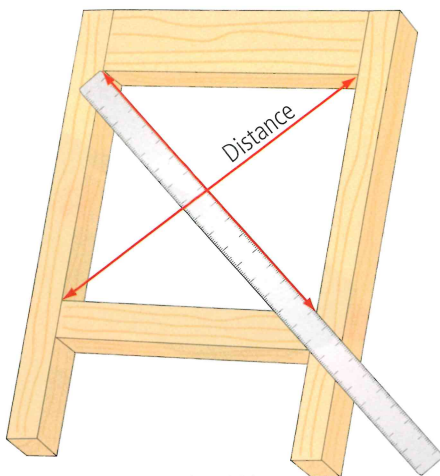


Stick

Methods for applying glue



Sash cramps on a frame



The distance should be the same on both diagonals for the piece to be square

Checking that the piece is square

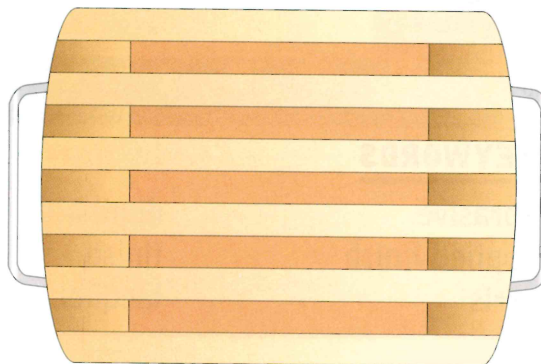


G-cramp and mitre cramp



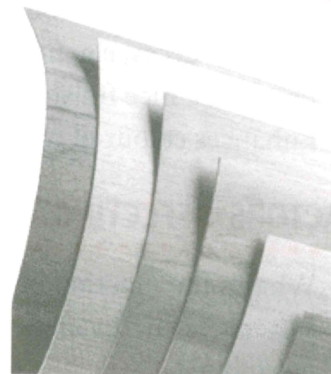
Exercises

- 1 What does PVA stand for?
- 2 Describe one adhesive that would be used for veneering a panel.
- 3 Name two glues that are quick setting.
- 4 Name two glues that are water-resistant and might be used outside.
- 5 Explain what the 'pot life' of glue is.
- 6 What glue would you choose for making a wooden chopping board as shown opposite? Give two reasons for your choice.
- 7 State two safety precautions to be observed when using contact glue.
- 8 Explain why a waste block of wood is used between the work and clamp.



Exam Question

- 1 The diagram shows a selection of wood veneers for use on a marquetry panel.
 - (a) Suggest the most suitable adhesive for gluing the veneers to the panel.
 - (b) Give a reason for your choice.
 (JC, HL, 2008)



Web Links

www.thisisthat.com/

www.lowes.com/lowes/lkn?action=howTo&p=BuyGuide/GlueGuide.html

www.geoffswoodwork.co.uk/adhesives.htm

www.bostik.co.uk/diy/brand/EVO-STIK