

There are three essential tasks involved in the making of any woodwork project. The first is to cut out and shape the components; the second is the joining of those components; and the third and final task is the finishing of the article.

This appendix provides you with information about the best ways to fasten your workpieces together, to ensure your project's long life.

The options are between adhesives, nails, screws and bolts.

NAILS

Nailing is a quick, efficient and economical way of joining timber. If the correct nails are chosen, there is no reason why the joints should not be durable. Timber framed houses, with most of the framing just nailed together, have stood the test of time.

The listing of nail types that follows provides an overview of commonly used nails. This listing is not complete – nails exist for specific purposes such as boat-building, but these are outside the requirements of the normal handyman.

Nail Types: Common

Bullet Head:	Used for hardwood framing and general fixing.
Flat Head:	Used for softwood framing, fixing softwoods or anywhere bullet heads would tend to pull through.
Wire Brads:	Small bullet head nails, used for attaching decorative mouldings.
Clouts:	Small nails with a relatively large flat head, used for attaching thin sheet material.

Nail Types: Special Purpose

Tacks:	Used principally for upholstery; commonly blue-black in colour.
Panel Pins:	Used for fixing plywood panelling to timber framing; "brown" plated.
Hardboard Nails:	Used to attach hardboard ("masonite"); generally zinc plated.
Plaster Board Nails:	Used for fixing plasterboard to timber framing; zinc plated.
Fibre Cement Nails:	Used for fixing fibre cement cladding; galvanised.
Particleboard Nails:	Used for fixing particleboard to particleboard; have helically threaded shanks.
Escutcheon Pins:	Small dome-headed nails, usually brass, for fixing key hole plates or similar.
Deformed Nails:	Have a helical threaded shank for improved holding power in soft timbers; usually galvanised.
Roof Nails:	Used for fixing galvanised iron roofing to timber framed roofs; manufactured with a dished washer which deforms to seal the nail hole; galvanised.
Fencing Staples:	Used to fix wire strands to timber.

User Hints

There are a number of important things to remember when nailing.

- Where possible, plan your nailing so that the strength of the joint depends upon resistance to sideways displacement of the nail, rather than direct withdrawal resistance.
 - When nailing, your hammer blows should have enough force to positively drive the nails into the timber. Insufficient force will tend to bend the nail.
 - You can lessen the possibility of your timber splitting by:
 - staggering your nails so that they do not run on the same grain line.
 - "punching" your nail, by placing the head onto the timber and hitting the point of the nail to flatten and blunt it. The blunt point will
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Fastening Guide

punch its way through, as opposed to a sharp point which separates the wood fibres by splitting them.

- Pre-drilling may be required in certain situations:
 - when nailing close to the edge of the workpiece.
 - when nailing a relatively brittle timber, such as Cypress Pine.
 - when nailing old or very dry timber.Drill holes to 80% of the nail diameter.
- You can strengthen the nailed joint by:
 - “toenailing” or “dovetailing” the nails. This is done by skew nailing at alternate angles.
 - “clenching” nails, where the end of a protruding nail is bent over, and hammered back into the timber.
- Processed nails (which have a coating of adhesive activated by the friction of the nail being driven into the wood) and deformed nails (helical threaded shanks) have considerably greater withdrawal resistance in softwoods.
- Protect the surface of your timber by stopping your nail head about 1mm proud. Finish nailing with a nail punch.

Disadvantages

1. The primary disadvantage of nailing is that it is difficult to pull the joint apart, without damaging the timber. To minimize the damage, use nail pincers. When using a claw hammer to remove nails, place a piece of scrap under the head of the hammer to both protect the workpiece, and provide additional leverage.
2. Nails driven into green timber can lose a significant degree of holding power as the timber seasons.

SCREWS

Screws have a number of distinct advantages over nails:

- They have much greater withdrawal resistance.
- They can be inserted without causing vibration or shock to the structure being assembled.
- They can be removed without damaging the surrounding timber.
- They can be removed and replaced without any great loss in holding power.
- They efficiently fix metal fittings, such as hinges, to timber.
- The variety of woodscrew types available permits their use in special situations, such as the use of fully threaded screws for joining particleboards or round-headed screws for slot-screwing.

Screw Types

Woodscrews come with different head shapes, drive recesses and shaft types.

Drive recesses commonly available are:

- Slotted head – for a straight driver blade.
- Phillips head – (cross recess) require a special bit.
- Posidrive head (modification of the Phillips head type, designed to be used with power screwdrivers).

Commonly available head shapes are:

- Countersunk.
- Round head.
- Raised head.
- Coach screws, useful for fastening large, heavy timber, utilize square or hexagonal heads.

Shaft types commonly available are:

- Partially threaded – used for normal woodwork applications.
 - Fully threaded – self-tapping screws, particle board screws (also used in very soft timbers, such as Western Red Cedar).
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Screws made from steel or brass are suitable for most purposes. For special needs, screws can be obtained in stainless steel, or monel metal, and can be plated in zinc, brass or chrome.



SLOTTED HEAD



PHILLIPS HEAD



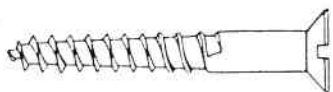
POSIDRIVE HEAD



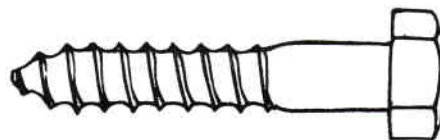
ROUNDED HEAD



RAISED HEAD



COUNTERSUNK



COACH SCREW

User Hints

- Pilot holes are needed for all non self-drilling screws.
The “outer” component to be joined must have a hole drilled with clearance for the shank of the woodscrew, so that the joint can be pulled up tight.
A pilot hole should also be drilled into the “inner” component so that the screw doesn’t follow the grain direction, and so that the thread of the screw is allowed to cut into the timber without binding.
- Woodscrews do not have significant strength if fastened into end grain. In these cases, the screw thread severs the wood fibres which would otherwise provide the holding power.
- If slotted screws are exposed, try to line their slots up parallel to the wood grain direction for improved appearance.
- For slotted head screws, the screwdriver point should be square ground and match the woodscrew slot closely, both in width and thickness. For Phillips and Posidrive screws, the correct size and type of bit must be used to avoid “camming-out” during installation.

Disadvantages

Woodscrews are relatively expensive and slow to use. For these reasons, their use is generally limited to cabinet/furniture making, and the fixing of metal fittings to timber.

ADHESIVES

Modern adhesives are easy to use and extremely efficient, often producing bonds which have a shear strength stronger than the wood. Gluing is advisable for permanent joins in cabinet/furniture making, even if the joint has been nailed or screwed.

Types of Adhesives

There are five types of adhesive of most use to the home woodworker:

PVA (POLYVINYL ACETATE):

An easy to use white glue which sets by water evaporating from the dispersion. Because of its water base, the glue is not suitable for exterior use, or for gluing any object in contact with moisture. PVA dries clear and is advertised as suitable for end grain gluing (but see the following note “Disadvantages”).

Fastening Guide

UREA/MELAMINE FORMALDEHYDES:

Produces a very strong bond with good water resistance. These are two-pack glues and require mixing as per manufacturer's directions. Clamping of the components for some hours is usually needed.

RESORCINOL FORMALDEHYDE:

Use of resorcinol glues is indicated when very high water resistance is required. Resorcinol formaldehyde adhesives are often used in boat building. Clamping of the components is required.

EPOXY ADHESIVES:

Another two-pack glue that displays excellent water resistance. The fumes can be toxic and care should be taken when handling epoxies. The glue sets clear, and can successfully bond metal to wood.

CONTACT ADHESIVES:

Usually in the form of a yellow viscous liquid, these are used when bonding glass, ceramics, plastics and plastic laminates.

User Hints

- To obtain satisfactory joint strength, the abutting surfaces must be smooth, clean and dry. The moisture content of the wood to be joined should be below 15%.
- The best bond strength is attained when both surfaces to be glued are in close contact – clamping is therefore desirable with all glues (except the contact cements).
- Setting time/clamping time will vary, and is dependent on the moisture content and porosity of the wood, the amount of adhesive used, and the external air temperature, as well as the nature of the adhesive itself.

Limitations & Disadvantages

There is still no adhesive that will satisfactorily butt join end sections of timber. End grain gluing is estimated to have only 10% of the strength of side grain gluing. When joining end sections of timber, scarfing is required (taper cuts on both end sections to increase glue surface, and to limit absorption of the adhesive into the porous end grain).

Adhesive joints are intended to be permanent, and cannot normally be pulled apart after curing, without causing damage to the wood component.

BOLTS

Bolts are normally used to satisfy a specific requirement for a knock-down capability or high strength assembly, but would normally be regarded as non-conventional in cabinet making.

The size of bolts required, their head forms etc. will normally be dictated by the details of the intended construction.
