Processes – Other Construction Techniques

Turning

Turning involves placing material on a lathe to form round sections. The piece being turned can be a single piece of solid timber or a laminated structure formed by joining a number of different pieces to form simple and complex patterns. Two main types of turning include between centres turning and bowl turning.

Between centres turning is generally used for spindle work such as turning legs for a table or stool. Pieces that need to be turned between centres and are longer than the lathe bed can be done by using shorter lengths and turning round tenons and drilling mortises allowing the shorter pieces to be joined to the desired length. Pieces turned between centres can be symmetrical or be turned 'off centre' by adjusting the centre on the piece or moving the tailstock.

Bowl turning can be done using faceplates or a variety of different expanding jaw chucks. Bowl turning affords a significant degree of freedom with shapes, materials and techniques and cab be done with ‘green’ or ‘wet’ timber, microwave seasoned and then finished on the lathe after a week or more of air drying.

Carving

Wood carving is the process of using sharp tools to cut a shape into a piece of timber resulting in a sculpture or decorative pattern. Tools used include knives, chisels, and gouges or in large scale jobs a chainsaw can be used!

The two main types of carving are chip carving and relief carving. Chip carving is often done on flat pieces and usually using geometric patterns. Relief carving usually creates an image, similar to a photo.

The timber to be carved needs to be selected very carefully. The harder the timber is the more difficult it will be to carve and the longer it will take. Typical timbers used for carving include Jelutong, Basswood and some fruit trees.

Paper patterns or templates of the image or pattern to be carved are almost always used to guide the carver.

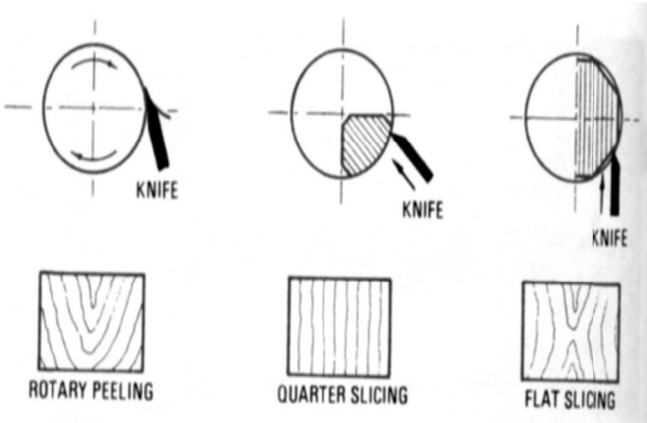
Inlaying

Inlaying is the insertion of a material, either the same or different to the base material. It is a decorative process often using contrasting timbers to create interest or hide imperfections in the base material or work that has been done (such as on a bad join). Inlaying can be done using solid timber or preformed patterns such as banding or marquetry.

Veneering

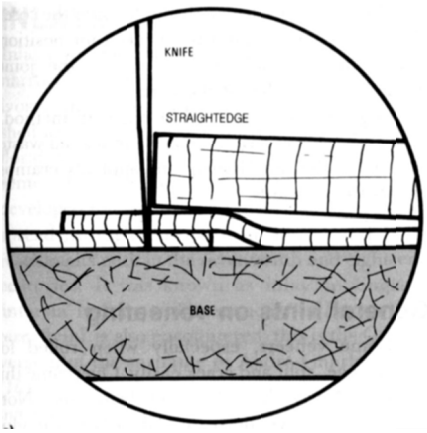
Veneering involves attaching a thin sheet of timber, usually about 0.7mm to 3mm in thickness, to a base piece.

Veneer can be cut a number of different ways to produce different patterns. These methods include Rotary Peeling and Slicing.



Rotary peeling involves attaching a log to a spit style machine and rotating it while a blade, like a very large plane blade, takes a continuous slice along the whole length of the log. This forms one very large sheet that is then cut to size.

Slicing usually means that the log is held stationary while the blade slices the thin sheets from it. By slicing in different directions a variety of patterns can be made.



When attaching the veneer to a small size base we just glue it straight on and cut the final shape after the glue has dried. Larger panels being veneered are a much harder thing to do. The sheets of veneer must be aligned perfectly and slightly overlapped so that they can be trimmed accurately. The joints should be almost invisible and the grain needs to be matched.

After attaching the veneer, all of the air needs to be removed from under the veneer using a veneer hammer or some other method. This should be done from the middle out so that no air is trapped.

Commercial inlays and bandings are available in a wide variety of different patterns. The inlays can be in the form of a motif such as floral arrangement or picture. They can be printed onto a thin veneer or pieces of different coloured veneers arranged to make a picture. The bandings are usually made from different coloured veneers glued together to form a thin pattern that can be used as a border.

When veneering the veneer cannot be applied to one side only. The base material must be veneered on both sides using the same or similar types of veneer to account for movement in the veneers. Veneering only one side can cause a thin substrate to cup or bend.

Marquetry

When making a picture using veneers the technique is called marquetry. Marquetry is very rarely done and takes a great deal of time, effort and skill. Pictures made using this technique either look very good or very bad depending on how well the pieces fit together. Veneers are often dyed to achieve a specific colour and the pattern and figure of the grain are considered when arranging and cutting pieces to achieve different effects.

Simple tools such as scalpel, paper guillotines, scissors and trimmers are often used to cut the veneers to shape. Templates are also used to mark and cut pieces to the correct shape.

Parquetry & Intarsia

Parquetry is the technique of creating an inlay using a geometric pattern with timber. It is most often used for flooring.

Intarsia is similar to marquetry except a thicker timber stock is used. The pieces often have rounded edges so the image created looks 3D.

Laminating

Laminating timber is the process of gluing layer upon layer of timber. It can be done in different ways to achieve different objectives.

Plywood is an example of a laminated timber product. In the case of plywood the grain direction of each sheet is laid perpendicular to the previous sheet.

Glulam is another laminated product where beams are created by laying each layer of timber with the grain running parallel to each other, or in the same direction.

Narrow section of timber can be glued together to form a wider panel, such as when constructing a breadboard. This is also called laminating.

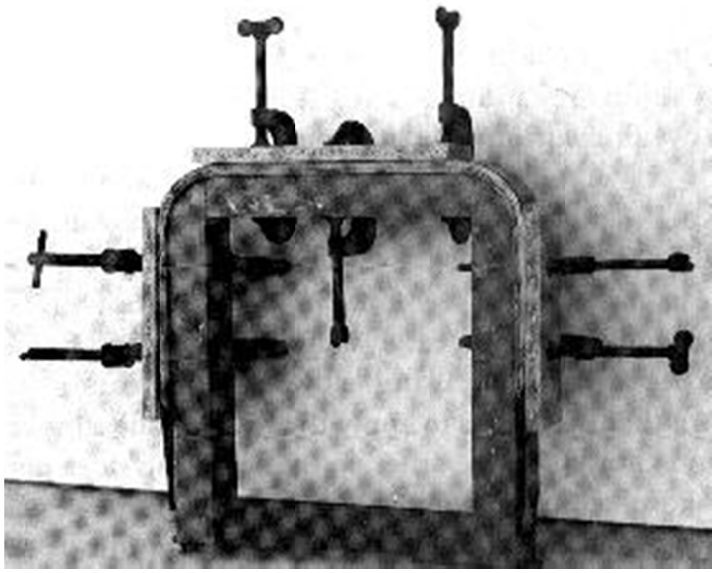
Bending

There are a few methods of producing curves in timber. One method is to get a large piece of timber, draw the curved shape onto the timber, and then use the bandsaw to cut the shape out. Using this method will result in a lot of waste material and could produce short grain. Short grain areas of timber are very weak.

Sometimes, if the timber is thin enough and the piece is long enough then you do not have to use any special processes to bend the timber, it will just bend. However if you want to make something with tight radius curves the timber will need to be steamed or laminated.

Laminating timber is the most common method used in the workshop to bend timber. The result is a strong product (think of plywood or Glulam) that is the shape we want, without the waste of cutting the shape from a solid piece of timber. Most laminated timbers have a better strength-to-weight ratio than steel. The difference between plywood and laminated structures are: plywood is usually made up of much thinner layers and the layers are arranged at right angles to each other.

When laminating we need a mould. The mould should be made with the radii slightly smaller than the finished product. This is because the laminated piece will want to spring back into its original shape. The mould can generally be made from any scrap timber that is lying around; you just have to make it the right shape. They can also be made of metal. When you make a mould be sure make places for the clamps to fit properly.

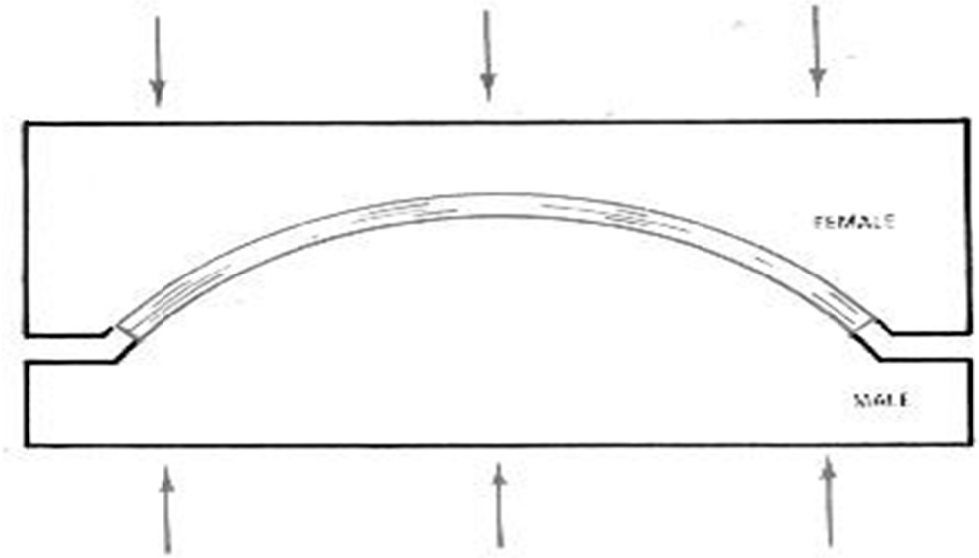


Hardwoods and softwoods can be laminated successfully if they are straight grained pieces. Knots and defects don't make a big impact on the strength of the piece because they are only located in one position on a single layer. When laminating a greasy feeling timber, sand across the grain before gluing. This will help the glue to adhere better.

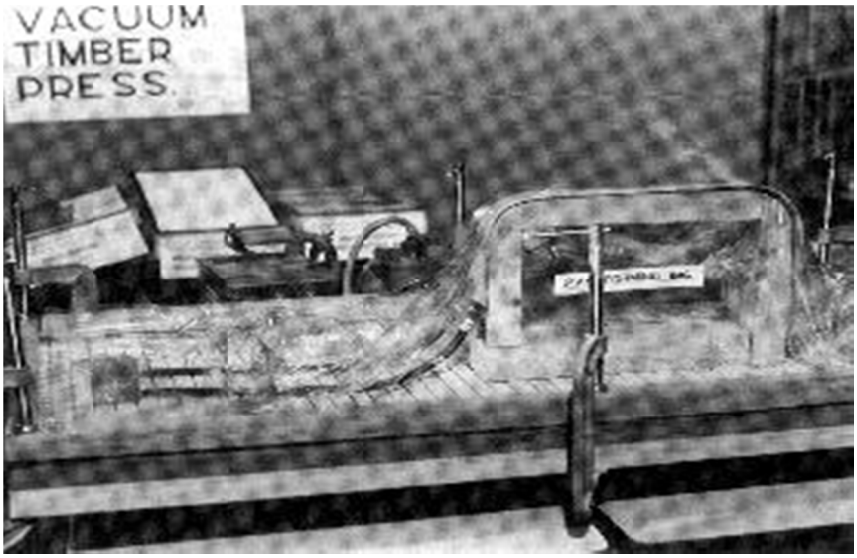
A suitable glue needs to be used when laminating. You need to take into consideration working time so you can satisfactorily position the pieces when laminating. The glue must be free from lumps or contaminants for laminating. The best form of glue is an epoxy resin with a slow acting catalyst. Urea Formaldehyde is a good adhesive to use and can be bought from West System Epoxy with a working time of about one hour. Glue needs to be applied evenly and the excess wiped off when the job has been clamped.

Industry use larger scale and more sophisticated versions of what we can do in the school. Hot and cold presses, vacuum bagging, and moulds with attached cramps are all methods used by industry to produce curved shapes with timber.

Hot and cold presses use a male and female half to make the mould. The timber is arranged in the mould and pressed until it is ready to be removed. The timber can be removed quicker using a heated press because the heat helps the glue to cure faster.



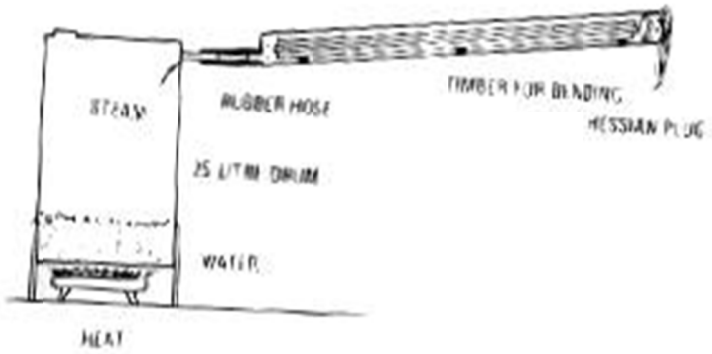
Vacuum bagging uses only half of a mould. The timber is arranged on the mould and the bag surrounding the job is sucked onto the mould by a vacuum. This vacuum uses heated air to cure the glue. The force of the vacuum is enough to force the timber to take the shape of the mould.



Various coatings are put onto the mould before they are used so that the timber does not stick to it. If the mould is only going to be used once or twice, such as in a classroom situation, then a Duroseal floor wax film can be applied to the mould and this will be enough. If the mould is going to be used a number of times then the mould may be lined with acrylic, rubber, stainless steel or tin plate, depending on if heat is being applied to the mould.

Steam bending is different from laminating because we do not cut the timber into thin pieces to be bent. The piece is left solid.

Steam bending usually involves a steam box. The work is left in another box. The steam box is attached to the box that contains the timber by means of a rubber hose. Once the timber has been left in the box for a sufficient time it must be removed very quickly and arranged in the mould. The timber can be very hot and working time is not long.



The steam box needs to have enough water in it so that the whole operation can be completed. A fire needs to be burning under the steam box. The timber needs to be left to dry before it can be used and any swollen timber needs to be sanded.

Plywood can be bent if thin sheets are used. This is usually the best material to use for large curved panels. It is best used when fitted into a groove that has been cut into solid timber to take the radius desired.

Particle board cannot be bent because it is too brittle. MDF can be bent by making cuts in the correct direction. This allows the MDF to bend because the piece being bent is not as solid as it originally was. Large panels of MDF can be bought that already have the slots cut into them so it can be bent like plywood panels. This is called Kerf Board.

Routing

Routing is an important process in the manufacture of timber products. It can be done to create joinery or for decorative purposes. Routing can be done using hand tools such as the router plane; or using machinery such as a plunge router or fixed base router. Larger scale routing is done by industry using CNC equipment such as a point-to-point router or mill.

1. What are the three main reasons that veneering is done?

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2. Use diagrams to show how each type of veneer is cut from a log.

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3. When bending timber using the lamination method, a compression strap can be used in place of the female half of the mould. What material is the compression strap commonly made from?

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4. What can be placed between the mould and material being laminated to prevent the pieces sticking to the mould?

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