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General Description of Plywood

Plywood is a flat wood-fibre panel made of sheets of veneer or plies that are bonded together with heat and under pressure with a glue or resin to form a board (plywood). The panel is always constructed with an odd number of layers of veneer in the board with each layer orientated perpendicular to the adjacent layers. This makes a symmetrical panel which is more stable.

The outside plies are called face and back plies and the inner layers are called core layers. Typically a higher-quality, visually-appealing face is used on the surface of the board while the balance of the lower quality veneer makes up the core of the board. Usually the grain direction of the outer panel is in the direction of the longer dimension of the panel.

Typical Properties of Plywood

The alternating layers provide panels with dimensional stability across the width of the panel and results in fairly similar axial strength and stiffness properties in perpendicular directions within the panel plane, unlike solid timber which has vastly different physical properties with and against the grain of the wood.

The laminated construction distributes defects in the wood (limiting the defect to one layer of veneer only in any position in the panel) and reduces splitting when fasteners are used through the panel.

Checking is also reduced.

The large flat panel allows cost effective coverage of large cross sectional areas using a minimal amount of wood fibre. These panels can be cut to customised sizes with little effort and standard equipment.

In simple language plywood splits, twists, warps, expands and shrinks less, holds nails and screws tighter, is stiffer in both directions and remains flatter than a panel made from the same type of solid timber.

Hardwood and Softwood Plywood

Broadly speaking, two categories of plywood are made. These are softwood and hardwood plywood. Softwood species have needles on the branches of the trees, while hardwood trees have broader leaves (angiosperms). The hard/soft description does not refer to the durability or strength of the fibre but to the family of trees. Both have softer and more durable species of timber.

All plywood currently made in South Africa is softwood plywood and is made from pine. The vast majority of this material is used in construction and industrial applications, although some clear, high-quality panels are made to be used as decorative clear or stained panels. In addition to the locally made pine plywood, some pine plywood is imported from Brazil and, to a lesser extent, China.

Three species of pine are grown for plywood in South Africa. These are pinus patula, elliottii and taeda, with the majority of material used being pinus patula. No differentiation is made by the forests with regard to species.

Hardwood plywood is made from a range of more species of hardwood that grow in tropical conditions. Most hardwood plywood in South Africa is imported from Malaysia and Indonesia, although material from Central Africa, South America, other countries along the Asian peninsula and China are also imported from time to time.

No tropical hardwood (commercial / Okume face) or marine plywood is made locally in SA.

South African pine plywood is manufactured following the guidelines set out in SANS929. Although local manufacturers follow this standard, the adoption of the standard is not compulsory and imported plywood often does not follow these minimum standards.

Face Grades

Plywood is specified according to the quality of the face and back panels, as well as the grade of resin used to make the panel.

Face grades of veneer are:

A – clear veneer, no cracks, no defects
B – limited tight knots, limited splits, limited discolouration
C – open knots, patched, larger splits patched, discoloration permitted
D – no minimum standard, defects unlimited.

Standard face / back combinations are BC (appearance grade), CC (shutter grade) and DD (crating grade). Other combinations may be specified by special order. (AA, AB, AC, BB, CD, etc.)

A and B faces are used in applications where a smooth, consistent and visually appealing surface is required. Faces are typically sanded. Most exposed furniture faces, doors, wall panelling, higher quality floor decking and precision applications use this grade of plywood.

C faces are used where a consistent, high-strength face is required but where appearance is not important. Most concrete shuttering use this grade and the product is often referred to as shutterply. Faces may be sanded (C+C+; C+C) or unsanded (CC).

D grade plywood is used where a low cost minimum spec panel is required. No quality constraints with regard to the veneer appearance apply. However, the plywood internal bond strength is required to be intact.

Reject or Downgrade plywood is sold with defects that do not qualify for the grades specified. Usually the cause of the rejection is due to the bond between veneer layers not being intact. This is referred to as blistering or delamination.

Additional properties of the faces of plywood are specified in Table 1 attached at the end of this note.

Adhesive Systems Used

Three adhesive types are used to bond the veneers together. They are urea formaldehyde (UF), melamine-reinforced urea formaldehyde (MUF) and phenol formaldehyde (PF). Resins are graded according to their moisture resistance.

These Classes are::

- Class 1 (Exterior) Exposed (intermittently or constantly) to water, or constantly to open air.
  - (PF) (suitable for extreme wet and high temperature exposure)
- Class 2 (Semi-exterior) At infrequent intervals exposed (partly or as a whole) to unprotected open air conditions.
  - (MUF) (suitable for most applications including shuttering)
- Class 3 (Humid interior) Constantly protected from water, but exposed to conditions which may cause components to attain a moisture content exceeding 170 g/kg
- Class 4 (Dry interior) Exposed to dry, sheltered (indoor) conditions
  - (UF) (suitable for backing, general furniture applications)

At present all South African made plywood is made from Class 1, phenol-formaldehyde (PF) glue. This provides the maximum durability and can sustain continuous exposure to higher temperatures and wet / high humidity conditions.

Crating grade plywood usually does not specify the grade of resin used and will also contain boards with limited face and edge damage.

Board Dimensions

Plywood is usually made in 2.440m x 1.220m (8 foot by 4 foot) panels with the following standard thicknesses:

4, 6, 9, 12, 16, 18, 21, 25, 29 and 32 mm

Other thicknesses can be custom made by special order.

Bulk supply of plywood is made in pallets with standard pallet sizes are as follows:

4mm	150 boards	18mm	50 boards
6mm	150 boards	21mm	50 boards
9mm	100 boards	25mm	40 boards
12mm	75 boards	29mm	30 boards
16mm	50 boards	32mm	30 boards

Plywood density is approximately 550 to 600kg/m3.

Boards with A or B faces are sanded. Those boards with a CC face may or may not be sanded, depending on specification.

Other Types of Veneered Panels

Blockboard

Blockboard is manufactured with a solid timber core of 12mm solid timber planks approximately 25mm in width and two layers of veneer on each face, one with its grain at 90 degrees to the other.

Two standard thicknesses are available, 18mm and 21mm. Other thicknesses can be made to order.

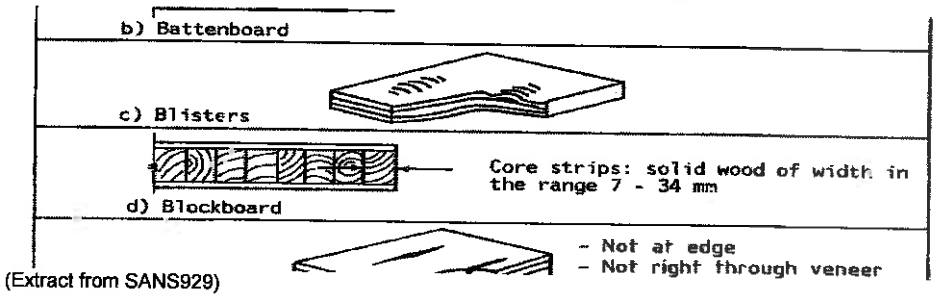
Two standard types of board are produced. These are:

Blockboard	BC face, with an interior (UF) resin
Shutterboard	CC face, with an exterior (PF) resin

Blockboard is sanded, shutterboard is normally not sanded.

Boards are packed in bundles of 50 boards per pallet.

Set out below is an extract from SANS 929, the standard describing all board products we manufacture, showing visually what the structure of the board looks like.

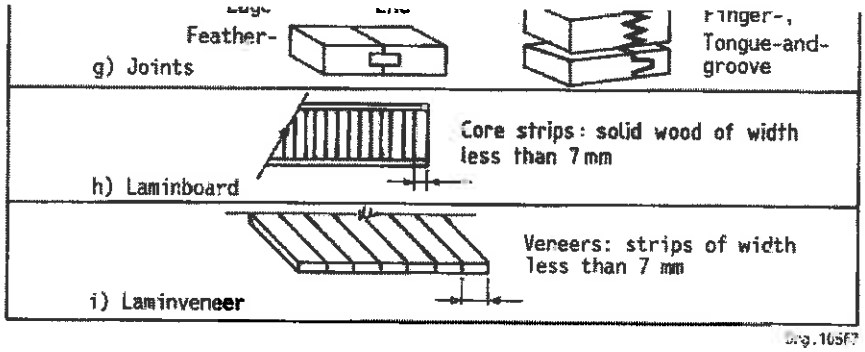


(Extract from SANS929)

Laminboard or Strip-ply

Strip-ply or laminboard is an engineered product made with a plywood core cut to 12mm and bonded vertically, with two veneers on each outer face.

Set out below is an extract from SANS 929, showing visually what the structure of the board looks like. It is shown technically described as laminboard.



(Extract from SANS929)

It performs in a similar way to blockboard and tests indicate that it has superior stiffness and bending strength compared to blockboard.

Initial practical testing of the product in field has shown that the product remains flatter and has more accurate physical dimensions than plywood.

Two thicknesses are available locally - 18 and 21mm. Standard face grades available are BC and CC.

Summary of Manufacturing Process

Production raw material inputs consist of pine timber and resin to bind the veneer. Lumber is purchased and felled from a variety of plantations in Mpumalanga and is transported to the plywood production facility using specialized log transport companies.

Logs are peeled using a rotary lathe into continuous rolls of wet veneer, 2.54m in width. These rolls are, in turn, trimmed using a clipper into veneer panels that are 1.28m in width.

These are dried in **a** steam powered dryer for 10 to 15 minutes at approximately 150 degrees Centigrade to produce dry veneer with a moisture content of 6 to 10 percent moisture content.

The dry veneer is then packaged into pallets of approximately 2.4m^3 or1.5 tons. The dry veneer is either sold in this form to the veneer industry or processed into plywood.

Plywood is processed by applying resin (urea formaldehyde or phenol formaldehyde) to alternate faces of the veneer and stacking this into packs. This pack is then inserted into a plywood press where it is compressed at high temperature and pressure to cure the resin and form the board.

Boards are between 4mm and 32mm in thickness and are made to the standard dimensions of 2.44m by 1.22m (8 foot by 4 foot). Pressed boards are edge trimmed to size, inspected for defects, their faces sanded to provide a smooth and clean finished appearance if required and then strapped into pallets of approximately 2.7m³ or 1.5 tons. These are shipped in bulk to retailers who sell the plywood as individual boards.