Frequently Asked Questions about Plywood

1. Is Marine Ply more durable than other types of plywood?

There are two common Marine Plywoods available in Australia; BS1088 Marine Plywood and AS/NZS 2272 Marine Plywood.

Both Marine Plywoods were originally developed to specify plywood meeting the exacting requirements of use in marine craft but has expanded to a wider range of use in other marine and general building applications. The most common misconception about Marine Plywood is that untreated Marine Plywood is highly durable. Marine Plywood was originally designed for use as a component in Marine craft not necessarily Marine environments.

Marine Plywood is made from timber veneers and is subject to the natural durability of the timber used in its construction. Almost all Marine Plywood falls in the natural durability Class 4 as defined in the Australian standard AS 5604. (Categories range from Class 1 Highly Durable to Class 4 Non-Durable) The phenolic resin adhesive forms a permanent bond that will not deteriorate under wet conditions and is more durable than the timber. Most statements concerning the durability of Marine Ply refer to the adhesive properties not the timber component.

Australian standard Marine can only be made from a list of approved species. These species have been assessed for their mechanical and physical properties and tend to be slightly more durable than average plywood, however they should still be regarded as natural durability Class 4. British Standard Marine is generally made from the heart wood of tropical hardwoods these tend to be more durable than species like radiata pine but most also fall in the natural durability rating of Class 4. Plywood can be treated with preservatives to make it more durable than untreated Marine Plywood however it should be noted that while preservatives help against rot and insect attack they general offer little or no protection from weathering effects such as, surface checking, swelling, and shrinking.

2. I want to use plywood outside. Does that mean I need to use Marine Ply?

No, there are other plywoods that can offer a similar design life to Marine Ply in an external exposed or semi exposed application. There are three main components to consider when assessing plywood for external use, the durability of the adhesive bond, the durability of the timber veneers, and how it can be protected from weathering as a component in a building system (i.e. fixings, coatings, workmanship, and maintenance).

There are other types of plywood with the same permanent phenolic resin or A-bond adhesive as used in Marine Ply. Most common are A-bond Structural plywood and A-bond/WBP decorative/general purpose plywood. Decorative/general purpose plywood is also available with adhesives suitable for semi-exposed applications (B-bond, WBP, MUF).

Almost all the timber veneers in untreated plywood fall within the same natural durability class as those in Marine ply. The same consideration for preservative treatments and coatings will be needed regardless of the type of plywood.

How plywood can be protected from weathering and moisture effects when installed as a component in a building system will largely determine the design life of any plywood including Marine Plywood.

Frequently Asked Questions about Plywood

3. Why is Marine Ply more expensive than most other types of plywood that look similar?

Marine Plywood is constructed from carefully selected veneers of the highest grades to give both structural integrity and a superior face quality. These veneers usually only make up about 5% of the veneer from a log. As a result, they are highly sought after and therefore more expensive than the more abundant lower grade veneers with less demand. Some decorative plywoods look like Marine Plywood, but it is the high quality of the veneer you can't see in the core that makes Marine Plywood more expensive. Additionally, Marine Plywood generally has more plies (layers of veneer) which means more gluelines. More gluelines equals more expensive.

4. What is the difference between BS1088 Marine and Australian Standard (AS/NZS 2272) Marine?

Although the two standards (British Standard BS1088 Marine Plywood and Australian Standard AS/NZS 2272 Marine Plywood) are different they are also similar in many respects. For example, it is possible to produce a single Marine Plywood that conforms to both standards. Both BS1088 and AS/NZS2272 provide standards and specifications that overlap to provide a suite of Marine Plywood products for use within the marine craft / boat building industry.

Although different both standards;

- Define the types of species available for use
- Provide construction/assembly specifications.
- Provide veneer specifications which strictly limit the amount of core gap and defects in all veneers (voids trap moisture and accelerate rot as well as physically weakening the plywood)
- Provide veneer specifications which prescribe the thickness in all veneers
- Provide bonding requirements suitable for a permanent structural waterproof bond between plies.

The result in both cases is a balanced consistent panel in which any small section of approximately 100 x100mm (4"x 4") within a sheet will behave almost identically to any other section and won't delaminate when exposed to occasional wetting. From a design stand point this is especially important for impact resistance on the hull of marine craft (sticks, logs, and other floating debris), the construction of narrow plywood ribs or bulkheads with large openings, and the use of plywood strips in strip built or clinker built construction.

BS1088 also provides the ability to provide light weight plywood, 'pink' coloured species, and cost effective solutions, while AS/NZS 2272 provides a more selective range of species selected for mechanical and physical properties, as well as limiting the thickness of core veneers to a maximum of 2.8mm. Additionally AS/NZS2272 Marine plywood has an assumed stress grade of F14 (unless otherwise marked) and can be used directly in conjunction with AS 1720.1-2010 Timber structures – Design methods and is consistent with the AS/NZS4063 Characterization of structural timber series.

5. What plywood should I use in a Marine environment?

To use plywood in a marine environment it can only be used as a component if it is protected by a coating or a system (e.g. fibreglass) to prevent direct environmental exposure. Marine environments (subject to prolonged immersion in sea water) are designated Hazard Class 'H6' according to Australian Standard AS 1604.
No plywood has been successfully treated to comply with the requirements of Hazard Class 'H6'.

Frequently Asked Questions about Plywood

6. Can I use plywood as a skateboard ramp?

Plywood's ability to be formed into curves and high strength for weight ratio means that it can be used as a component in skate ramps however there are some very important design considerations.

- Plywood is only a component. The shear forces from skateboard wheels far exceed the rolling shear forces in most plywood.
- Plywood is suitable for indoor or external temporary ramps only. Ramps exposed to the weather require treatments and coating systems to prevent degradation. That is why most permanent council skate parks are made from concrete.
- All ramps must incorporate and maintain a "wear layer" often a hardboard, metal, laminate, or epoxy system that must be regularly repaired and maintained to protect the underlying plywood component.

Plywood is not considered fit for purpose in skate ramps that do not follow these guidelines.

7. Can I use plywood outside?

Timber has been used as a building component both internally and externally for hundreds of years. Plywood is a timber product and when used externally needs the same consideration as natural timber. Plywood combines timbers natural beauty, with amazing engineering properties, environmental sustainability, and a low carbon footprint but it needs to be treated as a timber product. Some types of plywood can be used outside however the performance in exposed or semi-exposed applications will depend on how well the design process is completed.

Glue bonds in plywood are often described by the words 'Exterior', 'Marine', 'Moisture Resistant', or 'Interior' as part of the product description, these glue bond descriptives are often incorrectly ascribed to the whole plywood panel as a statement of the type of application for which the plywood can be used without additional preservative treatment or protective coating. They refer only to the glue bond and equal consideration is required for both the timber veneers in the plywood and the plywood as a component in a building system (i.e. fixings, coatings, workmanship, and maintenance) An important part of the design process involves a thorough understanding of the hazards and stresses the plywood will be exposed to in external applications.

The main hazards that need to be considered are:

- **Natural durability and hazard classes ('H')**
- **Biological Hazards**
  - i) In-ground and above ground decay
  - ii) Insects (inc. termites)
  - iii) Marine borers
- **Physical considerations**
  - i) Weathering
  - ii) Corrosion (of fasteners)

Frequently Asked Questions about Plywood

- **Occasional considerations**
  - i) Chemical degradation
  - ii) Fire resistance

It is important to remember that durability of plywood is not an inherent property of the material or component. It is the outcome of complex interactions among all the factors below.

- the service conditions;
- material characteristics including jointing material and adhesives;
- design and detailing;
- workmanship; and
- maintenance

Consideration of all of these are part of the design process.

8. What is the design process and how does this influence my choice of plywood?

The design process is to ensure timber structures and timber components like plywood can be designed to perform their intended function for a known life span, with minimal or programmed maintenance and which recognises all of the important aspects that relate to the durability of wood and other components of the timber system.

A summary of the design process is shown below. For a more in depth understanding the following publications are recommended.

Timber service life design – Design guide for durability a Technical Design Guide.
Forest and Wood Products Australia www.woodsolutions.com.au
Handbook: Durability in Buildings Including Plumbing Installations
Australian Building Codes Board (ABCB) www.abcb.gov.au

Design Process Summary

1) Determine the application and estimate required performance by considering

- required life
- required reliability
- initial vs ongoing cost

2) Determine what hazards, if any, are present

- borers
- termites
- decay
- weathering
- chemicals
- fire

Frequently Asked Questions about Plywood

3) Develop specifications to satisfy the above by considering factors affecting durability

3.1) Plywood specification

- Determine required durability class and hazard level
- Determine enhancements treatment, sealants, coatings required
- Determine architectural detailing and appearance required
- Specify plywood and bond type
- Specify plywood veneer grades and panel size
- Specify finishes coatings and treatments
- Specify maintenance program

3.2) Fixing and installation specification

- Determine required durability class and hazard level
- Determine type and corrosion resistance of fixings
- Determine architectural detailing and appearance
- Specify joint detailing
- Specify flashings and fixings appearance
- Specify finishes coatings and treatments
- Specify maintenance program

9. What do the terms H2, H2s, H3 mean?

The 'H' represents a system of Hazard Classes for wood products defined in Australian Standards that nominate the natural level of treatment required to protect wood products in various end use applications (see Q 39. Timber Hazard Levels – Exposure Guide). In this system, the higher the Hazard Class number, the more severe the exposure to biological hazard. The Hazard Class system is intrinsically linked to the design life.

10. What is 'water-proof' plywood?

There is no such thing as 'water-proof' plywood however the term persists in some common plywood descriptions. It usually refers to any plywood that has a permanent phenolic resin or A-bond adhesive that will not deteriorate under wet conditions. This will not make the plywood 'water-proof' as moisture will still pass through glueline and the timber veneers. The plywood will also still be affected by moisture induced weathering effects.

11. In the description of my plywood I often see the terms, A, B, C, or D bond, or sometimes WBP, MR or INT. What do these mean?

These terms are abbreviations to describe the adhesive bond type. Bond types are split into three broad categories based on their ability to withstand exposure to environmental conditions.

- Interior – long term exposure to medium humidity and occasional exposure to high humidity
- Semi exposed or limited exterior – withstands short term water soaking
- Fully exposed or fully exterior – withstands long term water soaking and drying

Frequently Asked Questions about Plywood

Glue bonds in plywood are also often described by the words 'Exterior', 'Marine', 'Moisture Resistant', or 'Interior' as part of the product description, these glue bond descriptives are often incorrectly ascribed to the whole plywood panel as a statement of the type of application for which the plywood can be used without additional preservative treatment or protective coating. They refer only to the glue bond and equal consideration is required for both the timber veneers in the plywood and the plywood as a component in a building system (ie. fixings, coatings, workmanship, and maintenance)

(*see Q 40 Commonly Available Plywood Bond Types)*

12. Are the glues used in interior plywood weaker than those used in structural plywood?

No, in fact some interior glues provide better bond adhesion than exterior or semi exterior glues. However interior glues generally do not have the ability to withstand moisture and/or higher temperatures and are not suitable for structural applications.

13. In the description of my plywood I often see the terms, AB, BB, CD, DD, or sometimes BB/CC, OVL/BTR, NS, PG. What do these mean?

These are plywood/veneer grades (e.g. AB, BB, BC, CD, DD, BB/CC, OVL/BTR, PG). Typically all world standards divide the veneer grade into 4-6 categories ranging from veneer having little or no defect to veneer with large open defects (holes or knots) and often including additional grades for specialty veneer with selected characteristics and for very low grade veneer often used for packing or pallets.

The plywood grade description is usually a combination of two veneer grades with the face veneer listed first. (e.g. plywood with a C grade face and a D grade back would be described as CD grade plywood). However, some plywood grades describe the face grade only, particularly plywood where one face only is likely to be seen (e.g. Door skins) or face grade is unimportant (Pallet or case grade).

ForestOne provides a large range of plywood from Australia, New Zealand, and all around the world. As different regions/countries often use different national/international manufacturing standards and different terms to describe plywood and veneer grades. The result can be confusing for anybody who is not aware of all the different world standards. To ensure the plywood you choose is fit for purpose it is important to understand the grading standards applicable to the type/class of plywood you require.

It is important to note that although different plywood grades use similar categories (e.g. A, B, C, D) actual grades may vary between plywood class/type. The actual grade is defined by a combination of veneer grade and product class/type.

Plywood/veneer grades are defined as a minimum specification. As plywood is a natural wood product differences within a grade will still exist between manufacturers, and production batches. To ensure your product is fit for purpose and meets your expectations all sheets should be inspected prior to use or re-manufacture especially for appearance grade products.

14. Will two different batches of plywood with the same veneer grade look the same?

Two different batches of plywood with the same veneer grade may still have significant differences in appearance. Plywood and veneer grades are defined as a minimum specification. As plywood is a natural wood product differences within a grade will still exist between manufacturers, and production batches. In order to ensure your product is fit for purpose and meets your expectations all sheets should be inspected prior to use or re-manufacture especially for appearance grade products.

Frequently Asked Questions about Plywood

15. How accurately do 'sample' pieces reflect the plywood I want to use?

Physical samples and photographs should be considered as a guide or indication only. While every attempt is made to ensure samples are as representative as possible it is not possible to accurately reflect all possible variations of a grade. Plywood and veneer grades are defined as a minimum specification. As plywood is a natural wood product differences within a grade will still exist between manufacturers, and production batches. To ensure your product is fit for purpose and meets your expectations all sheets should be inspected prior to use or re-manufacture especially for appearance grade products.

16. Why do most painting guidelines require twice as many coats on the edge of the plywood compared to the face and back?

Most of the environmental hazards for the use of plywood relate to exposure to moisture. Reducing exposure to moisture or the rate of change in moisture exchange with the environment reduces the environmental hazard risk. The end grain (parallel to the grain) of timber absorbs water significantly faster and in greater quantity than the face grain (perpendicular to the grain) and requires increased attention to reduce exposure to moisture or the rate of change in moisture exchange with the environment. Because plywood is made from layers of veneer glued together with adjacent layers having their wood grain rotated up to 90 degrees to one another, the end grain of the timber is exposed on all edges. Ensuring this end grain is sealed is why many painting guidelines require twice as many coats on the edge of the plywood compared to the face and back.

17. What do Bushfire Attack Level (BAL) and Fire Resistance Level (FRL) mean?

Bushfire Attack Level (BAL) refers to different bushfire intensity levels that a home may experience during a bushfire and the Fire Resistance Level (FRL) is the grading of a product or system when under fire attack expressed in minutes, for three criteria: structural adequacy, integrity and insulation (e.g. 30/30/30).

It is not always possible for suppliers like ForestOne to give recommendations as to whether or not a product is appropriate for different Bushfire Attack Levels (BAL) or Fire Resistance Level (FRL) as it is an interaction between environment, design, and construction that will determine if a product is appropriate. When a BAL level is provided it is always for a specific use and constrained by environment, design, and construction.

For example, ForestOne DesignerPly is compliant for use as eave linings to BAL–19 or less provided, BAL construction, including joints, penetrations, and ventilation openings, are to the same BAL requirements, all building code (BCA, NCC) requirements have been met (e.g. thickness, support spans, fastener type, fastener spacing), and consideration has been given to fit for purpose requirements (e.g. appearance, surface coatings, protection from moisture ingress, treatment, thermal bridging, fasteners, architectural detail)

It is important to realise that building for bushfire safety does not necessarily mean abandoning timber products and with appropriate design decisions you can still create an attractive timber home using timber products both inside and out. For more information and updates visit www.woodsolutions.com.au and search for "Design Guide 4, Building with Timber in Bushfire prone areas".

Frequently Asked Questions about Plywood

18. What is the 'Material Group Number' and what does it mean?

The Material Group Number (Groups 1-4) refers to the fire hazard requirements of different materials and is used primarily in designing for fire resistance in wall and ceiling linings in commercial buildings (BCA Classes 2-9). Materials in Group 1 are suitable for the most stringent fire hazard requirements. Materials in Group-4 do not meet the requirements for wall and ceiling linings in commercial buildings (BCA Classes 2-9).

Almost all solid plywood (≥ 9mm) is within the parameters for Group 3 but it is important to check the test results are available before using in commercial buildings. Without a test certificate the panel will be assumed to be group 4 (flammable) and not suitable for use in wall and ceiling linings in commercial buildings (BCA Classes 2-9).

19. Do perforations and slots change the Material Group Number for plywood and other panels?

Yes, full room burn tests to ISO 9705 shows a correlation between increased surface area and propagation of flame in a room. The more holes and slots the faster the panel will burn and therefore greater the Material Group Number. Openings in timber lining systems do reduce their fire resisting properties.

The usual Cone Calorimeter test AS/ NZS 3837 used for solid panels cannot predict full room fire testing when there are perforations, slots, or other openings in timber products. Therefore, you cannot use the fire test certificate for a solid panel in fire risk assessments on slotted and perforated panels.

Because there are so many combinations of surface area, wood type, specie, substrate thickness and finish, it is necessary to obtain fire engineering assessments on specific projects as they are specified.

20. What is the 'Critical Radiant Flux' and what does it mean?

Critical Radiant Flux is a measure of the radiant energy required to just sustain burning. It is primarily used regulate fire resistance of floor coverings in commercial buildings (BCA Classes 2-9).

21. What is the 'Spread of Flame and Smoke Developed Index' and what does it mean?

The Spread of Flame and Smoke Developed Index are measures of the speed at which flame spreads and how much smoke it creates. It is used primarily in designing for fire resistance in commercial buildings (BCA Classes 2-9).

22. What is the difference between structural plywood and other types of plywood?

Structural use can be defined as a load-bearing application for which predictable reliable load and/or engineering design values (characteristic values) are required. Structural plywood differs from other plywoods because it has defined characteristic values and is bonded with a structural glue bond which can withstand both long term static loading without deformation and long-term exposure to water and heat. To comply with the Building Code of Australian or the New Zealand Building Code plywood must be manufactured to AS/NZS 2269, AS/NZS 2272 or AS 6669 and have a permanent A-Bond. It is possible to use other plywood structurally, but it must be certified by an engineer and deemed to satisfy the performance requirements as outlined in AS 1720.1 Timber Structure – Design Methods and AS 1684 Timber Framing Code.

Frequently Asked Questions about Plywood

23. Does having more plies (layers of veneer) mean the plywood is better?

No, having more plies (layers of veneer) does not mean the plywood is better. It does mean that the properties to the panels will be different.

In simple terms plywood can be considered as two pieces of timber merged at 90 to each other. The number, placement, grade, and thickness of the veneers in each direction will determine the characteristic properties for the plywood. Assuming all the veneers are the same grade and thickness the higher the number of plies the closer it comes to having identical properties in both directions (parallel and perpendicular to the grain). This would be an advantage when making curved shapes such as in boat construction. Consequently, Marine Plywood tends to have more plies than structural or general-purpose plywood. In addition, more plies, and therefore less variation in properties in both directions, tends to make sheets more stable and less likely to bow or twist.

By using less plies and/or thicker veneers it is possible to increase the characteristic properties for the plywood in one direction. For example, plywood flooring is predominately used perpendicular to floor joists (parallel to span) and is stiffer and stronger if more or thicker veneers are used in the length of the sheet (the direction of use).

24. Is it better to have plywood with a thick face/back veneer or thin face/back veneer?

It depends entirely on the end use of the plywood. Both thin and thick veneers have advantages and disadvantages and will serve better in different applications.

For example, thin veneer face/back tends to resist weather exposure better than thick veneer. 'Face checking' or cracks parallel to the grain, tend to be reduced producing smaller cracks which are less likely to damage paint finishes. Thicker veneer face/backs tend to produce larger cracks under the same conditions. Alternatively, as the thickness of the face/back veneer has the greatest effect on bending strength and stiffness. Structural uses such as plywood flooring, which is predominately used perpendicular to floor joists (parallel to span), can benefit from a thicker face/back veneer to increase the stiffness and strength in the length of the sheet (the direction of use).

25. Is plywood with knots weaker than plywood without knots?

Natural characteristics such as knots or holes in veneer definitely decrease the relative strength of the veneer. However, timber is very good at 'sharing load' and particularly so with plywood due to its cross laminated construction. What this means in practice is that knots and holes make very little practical difference to strength until they reach about 30-75mm provided they are not in clusters or groups.

26. What are 'F-grades'?

F-grades are found on structural plywood manufactured to AS/NZS 2269. F-grades defined for structural plywood are F4, F5, F7, F8, F11, F14, F17, F22, F27 and F34. When an F-grade is applied to a sheet of structural plywood it must have the minimum characteristic properties associated with that F grade.

The minimum characteristic properties defined by the F grade are:

- Bending Strength
- Strength in tension
- Strength in shear

Frequently Asked Questions about Plywood

• Compression strength in the plane of the sheet
• Stiffness (Modulus of elasticity and rigidity)

These characteristics when used in conjunction with the thickness (t), moment of inertia (I), and section modulus (Z), allow engineers to design for load-bearing applications that require predictable reliable load and/or engineering design values.

27. Does all structural plywood have an 'F-grade' and why does it sometimes have two 'F-grades'?

No, the structural plywood to Australian standard AS/NZS 2269 also permits the publishing of the actual characteristic strength and stiffness values, span rating or performance rating instead of the F grade.

Plywood can be considered as approximating two pieces of timber merged at 90° to each other with different properties in both directions (parallel and perpendicular to the grain). For this reason, structural plywood can have two different stress grades parallel and perpendicular to the face grain. When this occurs both the stress grades, parallel and perpendicular to the face grain, are supplied in that order. (e.g., F17/F14)

28. Does a high 'F-grade' mean that it is stronger and stiffer than plywood with a low 'F-grade'?

If the plywood is the same construction (i.e. same thickness and same veneer layup), then a higher F grade will mean that it is stronger and stiffer than the plywood with a lower F-grade. However because stiffness and strength are a combination of the F-grade and the construction (section properties), it is possible to produce plywood with a lower stress grade that is stronger and stiffer in one direction than a similar plywood of the same thickness with a higher stress grade.

For example, plywood flooring, which is predominately used perpendicular to floor joists (parallel to span), can benefit from a thicker face/back veneer to increase the stiffness and strength in the length of the sheet (the direction of use). 19mm, F11 plywood with a 3.0mm face is stronger and stiffer than 19mm F14 plywood with a 2.4mm face in the direction of use.

Comparison – Parallel to the Face Grain (direction of use)

19mm F11 19-30-7 Ipara x (E) = 450 x 10 500 = 4 725 000 (9.4% Stiffer)

19mm F14 19-24-7 Ipara x (E) = 360 x 12 000 = 4 320 000

19mm F11 19-30-7 Zpara x (f'b) = 46.5 x 31 = 1 441.5 (5.4% Stronger)

19mm F14 19-24-7 Zpara x (f'b) = 38 x 36 = 1 368.0

29. Is plywood with a high 'F-grade' better than plywood with a low 'F-grade'?

No, having a higher F-grade does not mean the plywood is better. It does mean that the characteristic structural properties of the panels will be different.

For example, the lower F-grade plywood may be a higher veneer grade and look better, it may be of a timber specie that accepts preservative treatment better, and it may be made from a more readily available specie and therefore significantly cheaper.

Frequently Asked Questions about Plywood

30. What do the I&Z values associated with structural plywood mean?

The I&Z values associated with structural plywood are the sectional properties of the plywood. In other words, they are associated with how the plywood is constructed and will vary according to the number, placement, and thickness of the veneers in each direction.

(I) is the 'moment of inertia' and is used in determining 'stiffness' for a given construction

(Z) is the 'section modulus' and is used in determining 'strength' for a given construction

Plywood can be considered as approximating two pieces of timber merged at 90 to each other with different properties in both directions (parallel and perpendicular to the face grain). For this reason, structural plywood will have two sets of I&Z values; I&Z parallel to the face grain and, I&Z perpendicular to the face grain for determining stiffness and strength both along and across the sheet.

If the plywood is made to a standard construction the I&Z values can be found by looking up the identification code detailed in the brand on each sheet (e.g. 19-30-7, 17-24-7) in either;

AS/NZS 2269.0 Plywood – Structural, Appendix B Table B1 or

AS 1720.1-2010 Timber structures – Design methods, Appendix I Table I5

If the plywood is made to a non-standard construction the I&Z values can be found detailed in the brand itself (I&Z parallel / I&Z perpendicular).

e.g. (I 450 – Z 46.5 / I 155 – Z 21.5) or simply (450-46.5/155-21.5)

The moment of inertia (I), and section modulus (Z) when used in conjunction with the thickness (t), and characteristic properties (F grades), allow engineers to design for load-bearing applications that require predictable reliable load and/or engineering design values.

31. Do I need to use structural plywood for concrete formwork?

No, although concrete formwork is a load-bearing application for which predictable reliable load and/or engineering design values (characteristic values) are required, it is a temporary construction. For this reason, there is a separate standard for plywood used in concrete formwork AS 6669.

What this means in practical terms is that the glue bond only needs the ability to withstand both short term static loading without deformation and short-term exposure to water and heat.

Unlike the structural standard, the formply standard AS6669 allows the use of A-bond, B-bond, or C-bond glues. In most other respects the determination of engineering design values (characteristic values) is almost identical to structural plywood.

The other significant feature of plywood for concrete formwork is that it usually has a film or coating on the face and back which helps to prevent the plywood sticking to the concrete, allowing for multiple re-uses.

32. What is the difference between 'Film Face plywood' and 'Formply'?

'Film Face' plywood looks similar to 'Formply' but generally has no predictable reliable load and/or engineering design values (characteristic values) and therefore cannot not be used for concrete formwork which require predictable reliable load and/or engineering design values.

'Film Face' plywood is a general-purpose plywood that is coated with the same type of film used in 'Formply'. The film provides a smooth, prefinished surface that eliminates the need for painting and staining in some applications as well as reducing the ability for water to penetrate the surface of the plywood.

Frequently Asked Questions about Plywood

33. What do they use to make the film on Formply?

Formply can use several different coatings or films however the most common film is made from paper impregnated with phenolic adhesive (the same adhesive type as A-bond). During the manufacturing process the adhesive 'melts' flowing over the surface to produce the typical 'plastic' film seen on most formply.

34. Does the film on Formply make it waterproof?

No, the phenolic film on the surface of most formply only slows the rate at which moisture can penetrate the surface. The edges are usually sealed with paint which performs a similar function slowing the uptake of moisture.

35. Why are span tables for plywood floors different for residential and commercial buildings?

Although the properties of the plywood flooring don't change, the loads permissible for plywood floors differ in residential and commercial buildings. They are different primarily due to different capacity factors (Ø) for the category of building (AS 1720.1-2010 Timber structures – Design methods). In broad terms there are three categories with increasingly stringent requirements for structural elements: residential houses, commercial buildings, and buildings for essential services.

36. How do I know which plywood flooring to use?

To determine which plywood flooring to use there is information you or your supplier will require to ensure the correct specification.

Is it a residential or commercial building?

What is the intended use of the room? (i.e. residential floor, office, retail sales area)

What floor loads (if any) have been specified on the plan by the engineer?

- Concentrated Load* (kN) (*usually determines which plywood to use)
- Distributed Load (kPa)

What is the span (joist spacing) required?

If you have this information your supplier can assist you to find the right flooring for your application, or, if the flooring specified on your plan is not readily available they can help you find a possible alternative solution.

37. Can I directly stain or clear finish plywood flooring?

Decorative structural plywood flooring can be clear finished in the same way as strip timber flooring. However, do not use appearance grade plywood flooring as a platform during construction. If exposed to the weather, checking of the face will occur. For best results, the floor should be laid just prior to finishing. Any damage during construction can be problematic as there may be as little as 1mm of veneer available for re-sanding before the glue line is exposed. It is also important to note that most plywood flooring in Australia and New Zealand is made from pine species which are relatively soft timber that scratches and marks with relative ease when compared to hardwoods. It is essential this information is conveyed to the builder, the designer, and the end user (homeowner) to ensure the design limitations are understood and that the product is fit for purpose.

Frequently Asked Questions about Plywood

38. How much can I expect my plywood to bow or twist?

The tolerances for flatness (bowing and twisting) vary for different types of plywood manufactured to different standards and are best summarized in the statement, 'Bowing, cupping, twisting, are allowed provided it does not compromise the panel utility'. However, in all cases any statement or tolerance regarding flatness applies only to sheets before installation or use, stored correctly, acclimatized, and at equilibrium.

No manufacturer provides any warranty where flat plywood sheets distort on a job site due to incorrect storage, moisture, or weather exposure.

The design process should include adequate fixing to a support structure to allow for any potential hygroscopic movement due to changes in the service environment. (Expansion, contraction, bowing, cupping, twisting).

The cross-laminated veneers in plywood restricts the movement across the grain due to moisture and temperature changes. As a result, the dimensional stability due to moisture content and temperature changes in plywood will be better than other wood products from the same 'parent' timber. How much it will bow depends on the construction, the 'parent' timber/s, the rate of moisture/temperature change, and the amount of moisture temperature change.

As a rule four factors have the greatest effect on the flatness of plywood. The more stable the 'parent' timber, the smaller the sheet, the greater thickness, and the greater the number of plies (veneers) all result in a more homogeneous and stable plywood.

39. Can I use plywood without a supporting structure for use as cupboard doors and draw fronts?

We do not recommend the use of plywood without a supporting structure for use as cupboard doors and draw fronts.

Cupboard doors and draw fronts have very precise dimensional tolerances and require the plywood to be very stable and flat without a supporting structure. The cross-laminated veneers in plywood retain much of the variability of the original natural 'parent' timber resulting in a higher rejection rate due to twisting than for more homogeneous timber products such as Medium Density Fibreboard or Particleboard. If plywood is used without a supporting structure as cupboard doors and draw fronts allowance must be made by the user in the design process to accommodate a potentially higher rejection rate.

As a rule four factors have the greatest effect on the flatness of plywood. The more stable the 'parent' timber, the smaller the door, the greater thickness, and the greater the number of plies (veneers) all result in a more homogeneous and stable plywood.

40. What are the dimensional tolerances for plywood? (Length, width, thickness, and squareness)

The dimensional tolerances for plywood vary slightly for different types of plywood manufactured to different standards. Plywood with no defined manufacturing standard, such as Pallet or case grade plywood, also have no defined dimensional tolerances.

The International Standard (ISO 1954) for plywood dimensional tolerances may be used as an approximate guide to expected dimensional tolerances.

ISO 1954:2013 Tolerances on nominal thickness

Frequently Asked Questions about Plywood

41. Timber Hazard Levels – Exposure Guide

Hazard Level	Exposure	Specific Service Conditions	Biological Hazard	Typical Uses
Not Marked	Inside Above ground	Completely protected from the weather and well ventilated and protected from termites	N/A	Furniture Interior Joinery
H1	Inside Above ground	Completely protected from the weather and well ventilated and protected from termites	Lyctid Borer	Framing, flooring, furniture, interior joinery
H2	Inside Above ground	Protected from wetting. Nil leaching	Borers and Termites	Framing, flooring, etc, used in dry situations
H2F	Inside Above ground	Protected from wetting. Nil leaching	Borers and Termites	Framing, (envelope treatment) used in dry situations south of the Tropic of Capricorn only
H2S	Inside Above ground	Protected from wetting. Nil leaching	Borers and Termites	LVL/Plywood (glue-line treatment) used in dry situations south of the Tropic of Capricorn only
H3	Outside Above ground	Subject to periodic moderate wetting and leaching	Moderate decay, Borers and Termites	Weatherboard, fascia, pergola posts (above ground), window joinery, framing and decking
H3A	Outside Above ground	Products predominantly in vertical exposed situations and intended to have the supplementary paint coat system that is regularly maintained	Moderate decay, Borers and Termites	Fascia, bargeboards, exterior cladding, window joinery, door joinery and non-laminated verandah posts
H4	Outside, in-ground contact, contact with fresh water	Subject to severe wetting and leaching	Severe decay, Borers and Termites	Fence posts, greenhouses, pergola posts (in-ground) and landscaping timbers
H5	Marine waters	Subject to extreme wetting and leaching and/or where the critical use requires a higher degree of protection	Very severe decay, Borers and Termites	Retaining walls, piling, house stumps, building poles, cooling tower fill
H6	Marine Waters	Subject to prolonged immersion in sea water	Marine Wood Borers and Decay	Boat hulls, marine piles, jetty cross bracing

Notes:

1. Examples shown in this table are not exhaustive. 2. Not all preservatives are suitable for all hazard levels.

Frequently Asked Questions about Plywood

42. Commonly available plywood bond types

Guide to equivalency with service environments and international standards (ISO 12465)

Service Environment (Glue Bond)	**International Standards** (ISO 124465)	**Australian Standards** (AS/NZS 2754)	**British Standards** (BS 1203)	**European Standards** (EN 314)	**Japanese Standards** (JAS)	**American Standards** (APA)	**American Standards** (ANSI / HPVA)
Fully Exterior (Extreme long-term exposure to weather or damp conditions)	**Exposure 3** High humidity/ exterior conditions	**A-Bond**	**WBD (PF)**	**Class 3 (EN314-3)**	**Type Special**	**Exterior**	
Limited Exterior Short-term exposure to weather or wet or damp conditions)	**Exposure 2** Tropical dry/ humid conditions	**B-Bond**	**WBD (MPF or MUF) or BR**	**Class 2 (EN314-2)**	**Type I**	**Exposure 1**	**Type 1**
Interior Moisture Resistant (Withstands generally high humidity)	**Exposure 1** Dry conditions	**C-Bond**	**MR**	**Class 1 (EN314-1)**	**Type II**	**Interior**	**Type 2**
Interior (Withstands short-term high humidity)		**D-Bond**	**INT**				

Notes:

1. Equivalency to service environments or ISO exposure levels does not mean bond types are equivalent.