INFORMATION SHEET

STRUCTURAL MATERIALS

NZ WOOD
For a better world

PLYWOOD
SPECIFICATION

The information provided below has been taken from the New Zealand Timber Design Guide 2007, published by the Timber Industry Federation and edited by Professor A H Buchanan. To purchase a copy of the Timber Design Guide, visit www.nztif.co.nz

Spans and fixing requirements for plywood floors, roofs and decking can be found in manufacturer's literature. Plywood should be laid with the face grain across the joists. If the face grain is parallel to the joists the spans must be reduced accordingly.

Apart from load and span, designers must consider the type of floor covering or roofing, the effect of colour on cavity temperature, seasonal conditions, wind effects and the intended use of the building or surface that will determine exposure to moisture and sun radiation.

A minimum specification for plywood requires the identification of the visual quality of the face and back veneers (important for paints, stains, roofing or other coverings) and the stress grade for structural properties (important for structural design). Specification should also include the thickness of the face and back veneers and the number of plies (veneers) in the panel. This defines the section properties of the specified panel.

VISUAL QUALITY AND FINISHES:

The visual grade of a plywood sheet is assigned according to the visual quality of the face and back veneers, quality A, B, C, D or S. Each face grade is suited to particular uses according to the level of "defects" permitted in the grade. For example:

Grade A-C "A quality" face one side, suitable for a high quality paint or clear finish. "C quality" back face.

Grade B-B "B quality" face both sides, suitable for a quality paint finish.

Grade B-D "B quality" face one side, suitable for a quality paint finish. "D quality" back face.

Grade C-D "C quality" face one side, with filled defects, suitable as substrate for roofing membranes, flooring, concrete formwork. "D quality" back face.

Grade D-D "D quality" unfilled, on both faces. This is the basic structural panel for most structural applications, sarking, bracing, pallets, crates, etc.

Most of these are supplied with a sanded surface, but sometimes they are unsanded. For example, for roofing plywood, supplied as D-D grade, an unsanded surface provides extra grip for workers moving around on a sloping roof during construction.

Special enhancements may include resin impregnated cellulose overlay for formwork, or resin impregnated paper for signage. Plywood can have other surface finishes such as band sawn face veneers, grooved face veneers, or band sawn and grooved faces. For example:

Grade S-D A special surface quality (band sawn with limited splits) for cladding, and a D back face.

For architectural applications and clear finishes, it must be recognised that veneers are drawn from a variable wood resource and differences between trees result in various grain patterns. Visual grading is subjective, in spite of rules in a standard, and qualities will also vary between suppliers. Specifiers who are after a particular "look" should inspect

and select from merchant stocks. Paints and stains can be used to provide colour and protection, with acrylic systems generally working best. Consult manufacturers' literature.

FLOORING AND DECKING

Designers should ensure correct specification of plywood suited to floor traffic. The top two veneers of plywood for flooring or membrane substrates should be at least C or B grade, to provide a smooth solid surface for application of floor coverings. The back veneer should be visually acceptable when exposed to view. For highly trafficked floors, the softwood surface of most New Zealand radiata pine may mark, so a suitable covering like carpet, parquet or tiles is recommended.

VENTILATION

In the design of roofs and decks, ventilation of the roof space or cavity between deck plywood and a ceiling is a key part of ensuring good performance. Poorly ventilated spaces can develop very high temperature and moisture levels. The most likely source of moisture is the condensation of vapour from warm interior air on the underside of cold roofing. Good ventilation can remove the need for preservative treatment by removing excess moisture vapour in warmer climates, but H3 treatment is recommended in regions where winter nights are consistently cold. However, treatment is not an excuse for poor ventilation design. Moisture induced decay is only one issue. Enclosed roof spaces can be very tight and the dark colour of many roofing materials means that excessive heat can build up causing distortion in plywood or framing members, and moisture that remains will cause mould and staining of ceiling panels.

As a minimum, provide a vent area of 1/300th of the ceiling plan area (approx. 3350 mm^2 per square metre of ceiling) equally distributed at the eaves and ridges to allow free flow up the roof slope, and out. Roofing material suppliers have detailed proprietary ventilation systems suited to specific membrane or tile roofing including ridge capping and vents. Provision of forced ventilation should be considered in all cases.

STRESS GRADES

The stress grade of a plywood sheet is determined in accordance with AS/NZS 2269 from a process specification that may include sonic and resonance or other grading of the constituent veneers, followed by in-grade testing and continuous monitoring of plywood sample properties. Each sheet is labelled with an F grade or stress grade according to its claimed properties. Each F grade has an assigned characteristic bending stress, bending modulus of elasticity, compression stress, tension stress etc, given in Table 1.

Table 1: Characteristic stresses for dry structural plywood

Stress grade	Bending	Tension	Panel shear	Rolling shear	Compression in the plane of the sheet	Bearing normal to the plane of the sheet	Modulus of elasticity	Modulus of rigidity
	f_b	f_t	f_s	f_r	f_c	f_p	E	G
	(MPa)	(MPa)	(MPa)	(MPa)	(MPa)	(MPa)	(GPa)	(MPa)
F17	50	30	6.8	2.4	40	20	14.0	700
F14	40	25	6.1	2.2	30	15	12.0	625
F11	35	20	5.3	1.9	25	12	10.5	525
F8*	25	15	4.7	1.7	20	9.7	9.1	455
F7	20	12	4.2	1.5	15	7.7	7.9	345

*F8 is the most commonly available stress grade for plywood in New Zealand. F11 and other stress grades have limited availability.
For extremely high strength hardwood plywood grades and their characteristic values, refer to AS/NZS2269.

E is the short duration average modulus of elasticity.

G is the short duration average modulus of rigidity.