

# **Ecoply**

## **Performance and Durability**

Wood is strongest when stressed parallel to the grain and weakest across the grain, so the lay-up or arrangement of veneers in the panel determines the properties. Because of its cross-banded construction, plywood possesses significant strength and stiffness both parallel and perpendicular to the direction of the face grain.

### **Durability**

The durability of Ecoply structural plywood will depend on the application. Detailing, treatment and installation in accordance with Carter Holt Harvey installation instructions can be used to attain durability's in excess of most building needs. Normally, indefinite durability can be achieved with untreated plywood in dry, interior exposure protected from termites or with H3 treated plywood painted for exterior use in accordance with Carter Holt Harvey installation instructions. For internal environments subject to high humidity, condensation, or termites H3 treated plywood should be used. Unpainted H3 treated panels in exterior applications can be expected to last in excess of 15 years. For further information, refer to the Carter Holt Harvey "Durability Statement" 95/1/10.

### **Aesthetics**

Ecoply can have decorative or weather protection functions as well as structural performance. See product specific brochures for more detail.

### **Moisture Content**

At the time of dispatch of the plywood, the moisture content anywhere within a sheet when determined in accordance with AS 2098.1 shall be as follows:

- (a) Sheets not exceeding 7.5 mm thick not less than 10 percent or more than 15 percent.
- (b) Sheets exceeding 7.5mm thick not less than 8 percent or more than 15 percent.

### **Radiata pine**

Radiata pine is a plantation grown, medium density softwood. It is harvested to provide wood for plywood manufacture. The crop matures on a sustainable basis to yield millable trees at about 25 to 30 years of age.

### **Veneer and knots**

The veneer peeled from the logs may contain characteristics such as knots or splits. Knots have a significant effect on the tensile and bending strength of veneer; however, most applications of plywood in bending are governed by the stiffness or flexibility rather than strength. Knots have only a small influence on stiffness and so knotty plywood can be used for many applications. Knots can be removed and replaced with wood or synthetic patches to enhance appearance. The size of knots and other characteristics is controlled by grading into different qualities.

### **Resins**

The glues used to bond the veneers together are synthetic phenolic A:Bond (Marine) resins which are set and cured by heat and pressure under controlled conditions to form a strong and durable bond.

## Technical Details

### Treatment

Ecoply plywood if treated is impregnated to H3 hazard class with LOSP treatment to AS/NZS 1604.3 "Specification for preservative treatment, Part 3: Plywood" - refer to website.

H3 hazard class is described as:

"Timber or plywood that may be exposed to the weather, or used as the exterior covering of buildings, or as exterior joinery, but will not be in contact with the ground."

For more information see Technical Note "Preservative Treated Ecoply Plywood" 96/12/38.

### Identification

Ecoply plywoods are manufactured and branded to comply with AS/NZS 2269: 20094, by Carter Holt Harvey Limited.

All Ecoply products carry the following branding:

- The PAA "Tested Structural Stamp".
- Manufacturers Name - Carter Holt Harvey.
- The word structural or non-structural.
- Face grade, back grade bond ie A-Bond.
- Stress grade F8 and F11.
- Panel Construction Code ie 15-30-5.
- Australian Standard AS/NZS 2269.
- Mill No.



### Compliance with Building Codes

Structural plywood is the only sheet material with properties defined in published engineering design codes. Design to AS 1720.1 is deemed to satisfy the provisions of the Building Code of Australia in section B1.3 (f). Ecoply structural plywood is manufactured under a third party-audited, product quality control program to joint Australian/New Zealand Standard AS/NZS 2269: "Plywood-Structural" and carries the PAA JAS/ANZ accreditation.



The section properties of structural plywood are calculated in accordance with AS/NZS 2269 to allow for the reduced contribution of veneers perpendicular to the direction of stress. The

section properties for Ecoply structural plywood are in Table 3a. For engineering design, the section properties are multiplied by stresses and "k" factors to determine resistances for working stress design, or nominal strengths for limit states design. Resistances and nominal strengths in Table 3b and 3c assume all k factors are equal to 1.0. Multiply tabled values by the strength reduction factor (and k factors appropriate to specific in-service conditions for design to a specific code such as AS 1720.)

## International Standards





Carter Holt Harvey is certified as a Telarc registered supplier for the manufacture of veneer based products with a quality management system conforming to ISO 9002. Carter Holt Harvey is approved to manufacture structural plywood to the Japanese Agricultural Standard (J.A.S).

Carter Holt Harvey is licensed by the PAA (Plywood Association of Australia) to manufacture plywood which complies with AS/NZS 2269: Plywood- structural.

## Storage and Handling

- Keep dry.
- Store under cover.
- Handle and stack with care to avoid damage.
- Stack clear of the ground on at least three evenly spaced bearers.

**Table 1 - Product Data**

Description	Some Suggested End Uses	Products	Typical Appearance
Grade B Appearance grade with minor repairs. Suitable for high quality paint finishing.	<ul style="list-style-type: none"> <li>• Furniture and Joinery</li> <li>• Concrete formwork</li> <li>• Primary Sheathing</li> <li>• Signs</li> <li>• Engineered Components</li> <li>• Textured exterior cladding</li> </ul>	Ecoply - BD	
Grade C A solid sanded surface allowing filled holes and splits and small intergrown knots for a basic paint finish.	<ul style="list-style-type: none"> <li>• Gussets</li> <li>• Flooring</li> <li>• Bins, Boxes, Crates</li> <li>• Stressed skin panels</li> <li>• Hoardings</li> </ul>	Ecoply - CD	
Grade D Unfilled veneer allowing open holes to a maximum of 75 mm diameter. Splits and solid knots also allowable.	For structural applications where appearance is not a primary consideration. <ul style="list-style-type: none"> <li>• Structural Components</li> <li>• Beams, Portals</li> <li>• Roofing</li> <li>• Bracing</li> <li>• Utility Buildings</li> <li>• Decking</li> </ul>	Ecoply - DD	
Grade PG Non standard, non-structural veneer with unrestricted holes, knots, splits and rough grain.	<ul style="list-style-type: none"> <li>• Temporary Security Covers</li> <li>• Pallets</li> <li>• General Packaging</li> <li>• Fillets/Liners</li> <li>• Crates</li> </ul>	Pallet	
Grade S Allows imperfections and characteristics for appearance.	<ul style="list-style-type: none"> <li>• Decorative applications</li> <li>• Interior wall and ceiling lining</li> </ul>		

Product specific brochures are available from woodlogic – see back page for details.



7	7.2	7-24-3	0.04	273	80	3.77	37.20	19	16	1.67	19.40
9	9.0	9-30-3	0.05	533	124	4.70	46.52	36	25	2.08	24.29
12	12.0	12-24-5	0.06	1047	183	6.72	56.07	304	89	3.96	38.35
15	15.0	15-30-5	0.08	2048	286	8.42	70.13	593	138	4.94	47.90
17	16.8	17-24-7	0.09	2594	324	8.85	75.01	1110	195	6.87	57.22
19	19.2	19-30-7	0.10	4104	448	9.94	93.19	1429	227	7.76	58.06
21	21.0	21-30-7	0.11	5060	505	11.03	93.96	2175	305	8.56	71.50
25	24.6	25-30-9	0.13	8163	696	12.92	116.88	3467	391	10.09	77.15

Table 2c: Nominal strengths of Ecoply (square edge) structural plywood's for limit states design (replaces Table 3c in Carter Holt Harvey Ecoply Structural manual)

				SECTION RESISTANCES PER mm WIDTH							
				Parallel to the face grain (F8)				Perpendicular to the face grain			
Nominal plywood thickness	Actual thickness	Identification code*	Weight	Bending stiffness	Bending moment	Rolling shear	Axial compression	Bending stiffness	Bending moment	Rolling shear	Axial compression
				EI	fZ	FI/Q	fA	EI	fZ	FI/Q	fA
(mm)	(mm)		(kPa)	(1000 Nmm <sup>4</sup> )	(Nmm)	(N)	(N)	(1000 Nmm <sup>4</sup> )	(Nmm)	(N)	(N)
7	7.2	7-24-3	0.04	273	208	9.86	97	19	43	4.37	50.80
9	9.0	9-30-3	0.05	533	325	12.31	122	36	67	5.45	63.60
12	12.0	12-24-5	0.06	1047	480	17.59	147	304	232	10.36	100.40
15	15.0	15-30-5	0.08	2048	748	22.04	184	593	363	12.94	125.40
17	16.8	17-24-7	0.09	2594	848	23.18	196	1110	510	17.99	149.80
19	19.2	19-30-7	0.10	4104	1173	26.03	244	1429	595	20.33	152.00
21	21.0	21-30-7	0.11	5060	1323	28.88	246	2175	798	22.42	187.20
25	24.6	25-30-9	0.13	8163	1823	33.82	306	3467	1025	26.41	202.00

Table 4 - Recommended minimum bending radii for Ecoply plywood

Thickness (mm)	7	9	12	15	17	21
Along face (m)	1.8	2.3	3.6	4.6	5.9	7.4
Across face (m)	0.6	1.0	2.2	2.9	4.2	5.2

Table 5 - Minimum fastener specification

Plywood thickness	Timber framing		Screws in steel framing (size and load)	
	Nails (length, diameter, load)	Screws (gauge, root diameter, length, load)	Steel thickness approx 1.25 mm	Steel thickness 2.8 mm and over
Up to 9 mm	40 x 2.5 mm	No 8 (3.05 mm) x 30	10-16 45*	10-16 45
12 and 15 mm	50 x 2.8 mm	No 8 x 40	10-16 45	10-16 45
17	60 x 2.8 mm	No 10 (3.3 mm) x 40	10-16 45	14-20 45
19 to 21 mm	60 x 2.8 mm	No 10 x 45	10-16 45	14-20 45
25 mm	75 x 3.15 mm	No 10 x 50	10-16 45	14-20 45

\* Self drilling, self tapping, countersunk screw gauge-thread pitch-length in mm.

Table 3: Structural properties of Ecoply plywood's (replaces Table 6 in Carter Holt Harvey

## Ecoply Structural manual)

	Characteristic Stress Value MPa	
	F8	F11
Bending	25	35
Tension	15	20
Panel Shear	4.7	5.3
Rolling Shear	1.9	2.1
Compression (in plane)	20	25
Bearing (normal)	9.7	12
Modulus of elasticity E	9100	10500
Modulus of rigidity G	455	

Source: AS/NZS2269:2004

## Installation

### Framing

Framing spacings can be determined by design or using tables in Carter Holt Harvey brochures for products such as Plyfloor or Plybrace sheet bracing for houses.

### Nailing and fixing sheets

For exterior panels, allow a 2 to 3 mm expansion gap between sheets. Use only flat head nails or screws, with or without construction adhesives. Because of its cross banded construction, nails and screws can be placed close to the edge of the sheet to allow joining on narrow framing members. Nails must be at least 3 nail diameters or 7 mm from the edge of the sheet. Use recommended nailing practice as specified in product specific brochures. Typically, use 2.5 or 2.8 mm diameter flathead nails with lengths to give a penetration into framing timbers of at least 10 nail diameters. For standard nailing, nail edges and ends of sheets at 150 mm centres, and within the panel at no more than 300 mm centres. Do not over-drive gun-nails. Refer to product specific brochures for details.

Non-standard nailing may be used in accordance with AS 1720 or similar.

## Application

### Stucco

A range of plywood thicknesses are available to suit a number of frame spacings. This adds to design flexibility with curves or awkward corners to allow full support of the stucco.

For use under cement based plaster, Carter Holt Harvey recommends thicker Ecoply structural plywood to provide extra stiffness and dimensional stability to support the plaster during application, and to minimise the risk of cracking or buckling as it dries. Thinner specifications can be used (eg 7 mm vertically on studs at 400 mm centres) where experience with the particular sand type, plastering method and plywood thickness has given acceptable results. Paint stucco. Avoid dark colours. The most important factor with plywood under stucco is provision of expansion gaps between the plywood (3 mm) at all sheet edges.

Install breather type building paper over the plywood sheathing. Apply plaster in accordance with the relevant application standards and best industry practices, including control joints at 4 metre centres.

## **Textured coatings**

For flexible textured coating, use building paper under the plywood sheets. DD grade plywood may be used under textured coatings provided that the knot holes do not interfere with the expected visual quality. Otherwise use CD or BD grade or the textured BD face plywoods to provide an excellent substrate with the added advantage of a weather grooved shiplap edge. Apply textured coatings according to manufacturer's instructions. Check compatibility with preservative treatment. Joints in the plywood may require taping or stopping, depending on the specifications. All edges can be rebated with hand held tools to form a recess for a tape joint.

In CCA treated panels use stainless steel (316) or silicon bronze flathead nails or countersunk screws to avoid corrosion in unpainted sheets. With maintained paint, galvanised flat head nails may be used in CCA treated plywood provided the moisture content is below 20%.

## **Curved walls**

Shaped top and bottom plates or nogs can be jigsaw cut from thick (17, 21 or 25 mm) plywood. The covering plywood can then be fixed over the framework. Attach the outer edges with tack nails or clamps first to develop the curve, and then fix sheets from the centre out. Higher face grades should be considered for tight radius curves. Knotty face grades (C or D) may distort at the weaker knotty zones. Curvature of textured claddings should be limited to maintain weather groove function. For load bearing curves check capacity, using structural design.

Use the nail sizes recommended, but nail at 150 mm centres on all frames. Longer nails, screws, ring shank or annular groove nails will provide improved resistance to tension. Adhesives are not normally good in tension.

## **Technical Data Comparisons**

### **Strength of radiata pine**

The strength properties of radiata pine compare favourably with other species used for plywood manufacture (see Table 7). In particular it has a very high shear strength that leads to high splitting resistance when nailed. The properties in Table 7 are average maximum strength values for solid wood. For design these average strengths are reduced to provide safety margins and adjusted for plywood section properties (see Table 8).

### **References and sources of information**

Carter Holt Harvey Technical Notes and product specific brochures - refer to website.

AS/NZS 2269: "Plywood - Structural"

AS 1720: "Timber Structures Code"

ISO 9002 "Quality Systems"

J.A.S (Japan Agricultural Standard)  
Certificate of approval to manufacture  
structural plywood, 12 August, 1993

Plywood Association of Australia

Telephone: (07) 3854 1228

**Table 7 - Comparison of strength properties. Clear solid wood specimens, 2 inch ASTM basis.**

Species	Specific Gravity	Modulus of Rupture (kg/cm <sup>2</sup> )	Modulus of Elasticity (kg/cm <sup>2</sup> )	Compression strength (kg/cm <sup>2</sup> )	Shear strength (kg/cm <sup>2</sup> )
Engelmann spruce	0.35	650	91000	310	85
Siberian larch	0.48	950	128000	500	100
Douglas fir	0.48	900	125000	500	90
Radiata pine	0.46	930	108000	400	107
Lauan/Meranti	0.44	800	114000	410	86
Keruing	0.69	1020	185000	560	95

**Table 8 - Bending performance of some plywoods compared**

Thickness (mm)	Species	Layup	Resistance to bending deflection EI (Nmm <sup>2</sup> /mm)		Permissible bending moment M (Nmm/mm)	
			Parallel	Perpendicular	Parallel	Perpendicular
17.0	Radiata DD F11	7 x 2.4	2987000	1286000	373	225
18.0	Lauan/Meranti F11	1/5 x 3.2/1	2350000	2910000	274	381
12.0	Radiata	5/2.4	1207000	350000	211	102
12.0	Lauan/Meranti F8	1.5/3 x 3.0/1.5	794000	556000	125	117
12.0	Lauan/Meranti F11	1.5/3 x 3.0/1.5	916000	641000	160	149
12.0*	Radiata F11	1.5/3 x 3.0/1.5	916000	641000	160	149

\* This is not an Ecoply product but is shown for comparison.

### Limitations

All statements in this manual shall be read subject to the Ecoply plywood being properly stored, handled, installed, used and maintained as appropriate to each application in accordance with this brochure and product specific brochures and subject to the governing codes of practice. The information contained in this document is based on data available at the time of writing, which we believe is accurate and reliable. Carter Holt Harvey reserves the right to change the information without prior notice.