

*origin*TM *plywood*

handbook

at the source of great ideas in wood solutions



FLETCHER CHALLENGE
FORESTS



at the source of great ideas in wood solutions



Origin™ Plywood provides assurance & information to the building trades to create effective, cost-efficient structural solutions.

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Fletcher Challenge Forests has Forest Stewardship Council (FSC) Accreditation - independent certification that Fletcher Challenge Forests' estates are well-managed in accordance with the FSC's ecological, economic, and social standards.

Fletcher Challenge Forests is committed to sustainable plantation forestry, reducing pollution, maintaining water quality, proper waste management, conservation of natural resources, environmental accountability, and improving employee health and safety.

strength

Strength, impact resistance and stiffness are manufactured into every sheet of structural Origin™ Plywood. The grain of each radiata pine veneer alternates at right angles with the next, providing multi-directional strength and stiffness; this is an important attribute when designing bracing applications.

All Origin™ Plywood features solid cross-band veneer immediately below the face, ensuring maximum impact strength of the plywood surface.

At the core of plywood manufacture is the engineered “randomisation” of natural features, such as knots and resin pockets. Spreading these features through the cross-section of plywood provides superior strength and stiffness.

Structural Plywood Bracing Systems for dry internal applications are covered by BRANZ Appraisal, No. 224 (2001).



high quality, cost effective

Origin™ Plywood consistently exceeds industry quality standards for plywood, yet Origin™ Plywood remains a truly cost effective solution for a wide range of applications.

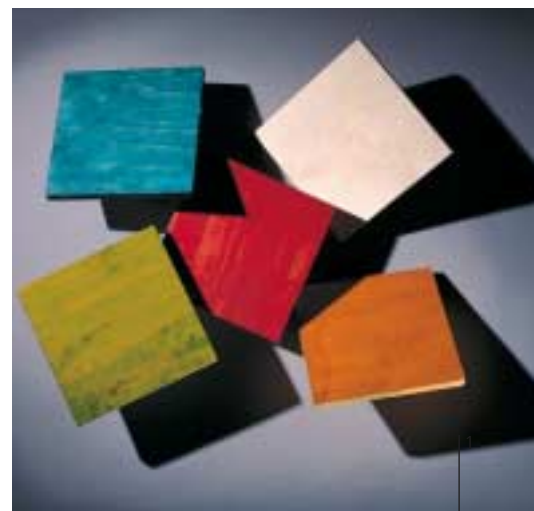


versatility

The use of Origin™ Plywood is limited only by imagination. It is equally suited to applications as diverse as structural bracing, flooring, packaging, exterior cladding and interior lining; from road signs and shop fittings to toy and novelty items. For over 40 years Origin™ Plywood has proven to be versatile in a range of applications.

health and safety

Standard (untreated) plywood has extremely low formaldehyde emissions, the lowest of any wood-based panel product. Standard structural plywood using phenolic (type-A) bonds have emissions of between 0.00 to 0.03 ppm., well below the international standard of 0.1ppm.

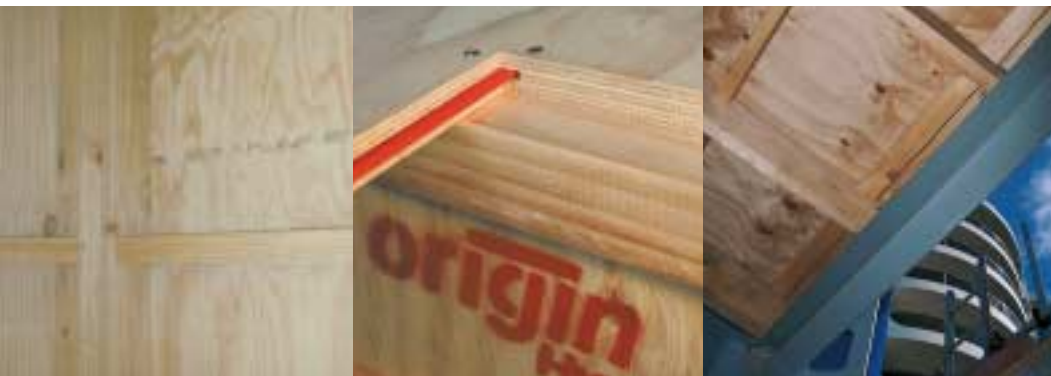


specifications

Origin™ Plywood is a panel board produced from radiata pine veneers. It is available in a range of thicknesses suitable for structural and non-structural applications.

Origin™ Plywood is available treated to NZ Timber Preservation Council hazard level H3. This is for use in above ground applications where moisture content can be expected to be greater than 18%.

Origin™ Plywood structural grades are manufactured to comply with AS/NZS 2269:1994 Plywood - Structural.



The approximate density of Origin™ Plywood is 550 kg/m³ (all types and sizes).

The Plywood Association of Australia (PAA) Process Quality Control Programme assures the quality of Origin™ Plywood. This Programme meets the requirements of an ISO Type 5 system for product certification.

structural applications

Structural Origin™ Plywood is produced using a phenol formaldehyde (PF) resin, which sets under controlled heat and pressure. It forms a permanent bond that will not deteriorate under wet, hot, or cold conditions.

The formaldehyde adhesives used in Origin™ Plywood are thermosetting and will not re-plasticise under reheating up to 930C. The resin does not smell and is resistant to breakdown over time.

Flooring

Strong, durable and easy to work with, structural Origin™ Plywood is an ideal flooring product. For added convenience in design and installation, Origin™ Plywood **flooring** is provided in tongue and groove (T&G) profile, in both 2400mm and 2700mm long sheets; the red polypropylene tongue readily identifies the Origin™ Plywood brand.

A unique benefit of Origin™ Plywood **long-span flooring** is the ability to create a solid floor using 600mm Origin™ *I-beam* spacing. Available in 19mm thickness, **long-span** is created with the top two and bottom two veneers orientated longitudinally; this maximises the structural stiffness when laid at right-angles to joists.

The combined advantages of Origin™ Plywood **long-span**

Bracing

Structural Origin™ Plywood is the fast, efficient and durable solution for bracing timber-framed houses, industrial, commercial and agricultural buildings. Its inherent strength provides maximum bracing, even in situations where earthquake risks are high and strong winds are prevalent.

Treated H3 structural Origin™ Plywood is especially suited for use in applications where high moisture levels may occur or where it will have constant exposure to the weather. This level of treatment is only intended for out of ground contact applications. Furthermore,

it is strongly recommended that it is painted with an approved coating system.

It is important to apply Origin™ Plywood to framing with moisture content of 12-16% at the time of construction and that it remains dry (<18% m.c.) during its service life.

Structural Origin™ Plywood is certified by BRANZ as an acceptable bracing product which meets the requirements of the New Zealand Building Code (NZBC). For installation details refer to the section: **bracing**.

flooring and Origin™ *I-beam* provide a cost effective Origin™ *I-floor* solution that will remain structurally and dimensionally stable. Benefits include wider joist spacing, a solid and stable surface, light-weight handling during construction, the elimination of blocking in most applications, and a "squeak-free" floor.

Its strength and rigidity make it a stable sub-floor for quality interior finishes, such as ceramics, tiles and parquet, as well as vinyls and carpet. In wet areas, such as laundries and bathrooms, treated Origin™ Plywood **flooring** will meet the durability requirements of the NZBC.

Easily cut to accommodate fittings such as sanitary pipes, or design features such as curves, Origin™ Plywood is one of the



easiest flooring materials to install and is available in a range of thicknesses. Thicker plywood sheets are especially cost-effective in multi-storey buildings as they require fewer supporting joists. The high point load strength of Origin™ Plywood **flooring** makes it well suited for light garage floors as well as industrial and commercial applications.

Installation details are provided in the section: **flooring, decking and roofing**.

structural applications

Roofing

Origin™ Plywood **roofing**, with its T&G edge profile, is a natural choice as a substrate for waterproof membrane systems, tiles or shingles. It provides excellent thermal and acoustic insulation qualities, plus strength and rigidity without excessive weight.

An easily worked product, Origin™ Plywood **roofing** can be

cut to a variety of shapes without sacrificing any performance properties.

Installation details are provided in the section: **flooring, decking and roofing**.



Lining

The V-groove Origin™ Plywood **lining** provides an attractive finish to wall linings and ceilings, and adds bracing resistance when installed in accordance with the specifications for bracing detailed in this handbook.

Origin™ Plywood **lining** is available both untreated and treated; untreated is intended for interior application whereas treated (H3) is intended for use in soffits.



Cladding

Featuring a variety of attractive face finishes and profiles, combined with the bracing qualities of structural plywood, Origin™ Plywood **cladding** products provide very cost-effective solutions for residential, commercial and agricultural buildings.

Origin™ Plywood **cladding** is treated against insect attack and meets the New Zealand Timber Preservation Council's H3 hazard

specification for lumber exposed on building exteriors, but not in ground contact.

Origin™ Plywood **cladding** meets the Building Code requirements for bracing when installed in accordance with the specifications for bracing and paint system details for cladding, as provided in this Handbook.



Packaging and industrial

The laminated construction of Origin™ Plywood makes it durable in the toughest industrial situations. Ideal for truck decks, horse floats, trailers, and other applications where safety and

strength are important considerations. Its smooth but tough surface makes Origin™ Plywood practical and economical for warehouse shelving, crates, produce bins and pallets.

appearance applications

Premium

Origin™ Plywood **premium** grade is a structural plywood designed for use in appearance applications. When used with an epoxy resin, **premium** is suitable in boat building as decking, superstructure, gussets and bulkheads.

The specialised lay-up of Origin™ Plywood **premium** comprises a

“gap-free” interior core that provides excellent edge finishing after cutting and guarantees superior bolt-holding capability.

Premium is an excellent substrate and finishing plywood for yacht fit-outs and interior fittings, furniture and cabinet making, combining strength and great looks.



Furniture

Created specifically for furniture production, Origin™ Plywood **furniture** grade is a recognised solution for backing, lining and feature panelling in furniture products. Available in a range of grades, Origin™ Plywood **furniture** provides the ideal furniture solution from a finishing surface to a veneer substrate.



product information

Origin™ Plywood is manufactured and marketed by Fletcher Challenge Forests Limited. It is a layered panel product comprised of radiata pine veneers bonded together. It can be used in a range of applications from furniture and ceilings to bracing and cladding.

Origin™ Plywood is available in four face grades: A, B, C, D; each providing different appearance finishes for intended applications.

Origin™ Plywood, in compliance with New Zealand and Australian requirements for the building code, must be kept clear of ground contact and, unless H3 treated, should be protected from the weather.



Table 1
Origin™ Plywood structural grade specifications and preservative treatment

Face grade	A-grade	B-grade
<i>General description</i>	Selected for clear wood grain and limited natural features, to create a refined wood appearance.	Displays attractive wood character with minor features blended with uniform wood grain.
<i>AS/NZS 2269:1994</i> (dimensions are read across the face)	Filled holes <6mm Tight knots <4mm Filled splits <3mm	Filled holes <20mm Tight knots <25mm Filled splits <3mm
<i>Products</i>	Classic cladding and lining	Premium (B-faces & core) BB (B-faces) BD Pioneer cladding
<i>Packet colour code</i>	No colour code	BD – black Others – no colour code
<i>Intended finish</i> (Grain patterns may show through finishes)	Clear varnish, light stain, gloss paint.	Stain, semi-gloss and satin paint.

Table 2
Origin™ Plywood applications

Product:	Applications
Structural	Bracing, flooring, roofing, shelving, concrete formwork cladding, truck decks, containers, pallets or any applications where a strong and durable product is required.
Flooring – T&G	Flooring solutions with ease-of-installation and superior performance. The long-span flooring and Origin™ I-beam create a highly efficient and cost effective flooring solution – Origin™ I-floor
Roofing – T&G	Roofing solutions as a substrate to permanent roofing materials
Cladding	Decorative and structural exterior cladding
Lining	Decorative and structural interior lining
Premium	Furniture, yacht fit-outs, boat decks, gussets, bulkheads or other applications that need strength and a high quality finish
Furniture	Door-skins, shelving, backing for cabinets, draw bottoms or other furniture

The quality of structural Origin™ Plywood is assured by the Plywood Association of Australia (PAA) process quality control programme. This programme meets the requirements of an ISO Type 5 system for product certification. The PAA is an accredited body to JAS-ANZ under Registration No. Z1460695AB.

product information

Each sheet of Origin™ Plywood is ink-jet marked on the back face, as per the example shown below; the exceptions to this are Origin™ Plywood **premium** and BB grades which, because of their high quality face finish, are left without product marking.

Detail on Product:	Origin™ Plywood 17mm = 2.4-7	STRUCTURAL F11	A Bond R061100 DCT	AS/NZS 2269	PAA915
Descriptions of detail:	Product name Thickness, veneer lay-up	Intended application Strength rating	Glue type Date of production	Australasian Standard	Plywood Assoc. Mill number

C-grade	D-grade	Preservative treatment
Highlights the true nature of wood with sound natural features and distinctive wood grain, providing lively and textured character. Filled holes <50mm Tight knots <50mm Filled splits <9mm x 1/2 sheet length or <12mm x 600mm long	Non-appearance face. DD intended for structural applications and high-strength packaging. Holes <75mm Knots: no limit Open splits <15mm x 1/2 sheet length or <25mm x 1/3 sheet length	Standard – not treated – for use in applications that are not exposed to weather. H3 – for use outdoors, exposed to weather but not in ground contact. CCA: Green in colour. Intended for exterior structural plywood. LOSP: Clear of colour. Appearance plywood such as cladding.
CD Flooring	DD Long-span flooring (filled face) Roofing	
Blue colour code	Green colour code	
Clear varnish or light stain to bring out wood character. Use low-sheen and flat paints.	Not intended for visual appeal but more for a structural substrate.	

Storage and handling

To gain the full benefits of Origin™ Plywood, it should be kept dry.

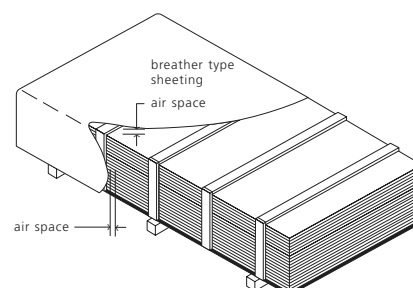
To ensure the product integrity the following details must be followed prior to installation:

- Store under cover to keep panels clean and dry; this will prevent moisture up-take and distortion
- Place on three evenly spaced bearers (or four with 2700mm sheets) on flat ground to avoid

panels bending

- Store where ponding will not occur
- Keep plastic covers or tarpaulins clear from face and edges of the stack to ensure good ventilation
- Maintain equilibrium moisture and temperature across all faces and sides of the plywood to retain sheet stability
- Take all care to avoid damaging plywood faces, edges and corners.

Figure 1 – Recommended storage



product information

Structure

Origin™ Plywood structural products, when used as prescribed in this handbook, meet the structural performance requirements of the New Zealand Building Code. It is advisable to allow plywood

sheets to “condition” prior to fixing, particularly when used in interior applications. Allowing plywood time to adjust to humidity levels of the end-use environment will minimise any chance of distortion.

Finishing

Origin™ Plywood used in structural, cladding, and lining applications should be coated with a flexible paint system to maintain durability. The use of inflexible, enamel paints is not recommended.

LOSP-treated Origin™ Plywood must be left unpainted and well ventilated for a minimum three weeks prior to paint application; this permits excess solvents in the preservative treatment to evaporate, therein ensuring maximum paint adhesion.

To “plug” fixing holes, use a proprietary filler that is compatible with the chosen finishing system. It is important to use a filler that provides the required impact durability.

Top quality 100% acrylic paint systems perform to their maximum if applied according to paint manufacturer’s recommendations. Maintenance of the paint surface system will ensure paint durability over a long service life.

Before painting CCA H3 treated plywood, brush the surface with a

hard bristle brush or lightly sand to remove any surface residues. The recommended paint system for treated panels is:

- edges sealed with primer
- 1st coat 100% acrylic stain blocking sealer
- 2nd coat 100% acrylic exterior undercoat
- 3rd coat 100% acrylic exterior top coat.

Light colours are recommended. Darker colours absorb heat, which results in wood movement encouraging surface checking.

Clear finishes are not recommended as these provide limited protection. CD50-type finishes are not recommended for use with plywood.

It is not necessary to seal plywood for flooring if being overlaid with floor coverings, eg carpet, tiles, cork, and wood over-lays.

The New Zealand Paint Manufacturers Association can be contacted for further details on the finishing of plywood.



Durability

Origin™ Plywood will meet the requirements of NZS 3604:1999 when handled, installed, used and maintained in accordance with the requirements documented in this handbook.

Untreated Origin™ Plywood should only be used in locations where the moisture content (m.c.) of the plywood and adjoining framing will be maintained at less than 18%. Conditions exceeding or likely to exceed 18% m.c. require Origin™ Plywood treated to H3.

Short term exposure during construction (up to 3 months) should not effect durability of untreated plywood unless used in locations where drying will be very slow. In these circumstances, harmless mildew and mould may develop on the plywood surface; although unsightly, these are not detrimental to the integrity of the plywood and should be cleaned off prior to application of surface coatings. To maintain product integrity it is important to prevent ponding of rain water.

Galvanised fastenings will be suitable for treated plywood cladding to meet the 15-year durability requirements of the NZBC. For bracing applications and for cladding exposed to sea spray or geothermal hot spots, stainless steel or silicon bronze nails are required to achieve 50-year durability; refer Table 4.3 - Materials for nails, NZS 3604:1999.

product information

Health and safety

Plywood is a reconstituted wood product and should be handled in accordance with safe work practices. As with all wood products, exposure to dust from plywood may cause irritation to eyes, respiratory system and skin; it may cause sensitisation by inhalation and skin contact.

Work areas should be kept clean. Sawing and routing equipment should be fitted with dust extractors that ensure dust

levels are kept within standards laid down by Occupational Safety and Health New Zealand, Worksafe Australia, or the specific country of use. Where dust extraction is not provided, it is recommended to wear a dust mask conforming to AS/NZS 1715 and AS/NZS 1716 and eye protection conforming to AS/NZS 1337. Repeated inhalation of wood dust over many years may increase the risk of nasal cancer.



Origin™ *I-floor* supplemented with noggings to achieve fire rating as per Gib® Fire Rated Systems.

Fire rating

Fire resistance in the form of a fire rating can not be applied to a single product. It can only be attached to a building system incorporating plywood.

The NZBC outlines minimum requirements concerning fire and buildings according to the occupancy of a building. Plywood when used as a lining, cladding or flooring must comply with the legal requirements of the NZBC. Acceptable Solution C/AS1, Parts 1-9 provides ideas for designers to meet the legal requirements, but other acceptable solutions can be designed in consultation with the Building Code.

As defined in AS 1530 (Part 3), the early fire hazard indices for untreated radiata pine plywood are as follows:

Table 4
Early fire hazard indices for untreated radiata pine plywood (Internal fire spread)

Ignitability index	14	(0-20)
Spread of flame index	8	(0-10)
Heat evolved index	9	(0-10)
Smoke developed index	2	(0-10)
(Bracketed figures are the possible index range).		

technical information and support

Dimensional tolerances

These tolerance specifications are derived from AS/NZS 2269:1994, Section 1.6.

These tolerances are the maximum to be expected in Origin™ Plywood. Certainly, the specifications applied in the internal quality control systems for Origin™ Plywood production are significantly more stringent than provided in AS/NZS 2269:1994.

Thickness

Sanded sheets:

3 – 7mm +/-5%

9 – 17mm +/-4%

19 – 25mm +/-3%

Unsanded sheets:

added tolerance +0.3mm

Length and width +/-1.5mm

Squareness

The difference in measurements of the length of the two diagonals of a sheet will not exceed 0.2% of the length of the longer diagonal.

The following guidelines apply:

2400mm sheets 5.36mm

2700mm sheets 5.90mm



Straightness of edge

The maximum allowable deviation of any sheet edge from a straight line is 0.05% of the length of the edge; the following apply:

1200mm 0.60mm

2400mm 1.20mm

2700mm 1.35mm

Flatness

Unloaded sheets

The maximum space from the underside of a sheet and a flat horizontal surface:

3 – 7mm 50mm

over 7mm 30mm

Loaded sheets

With three corners of a sheet held to a flat surface, the following tolerances are permitted under the stated load applied to a fourth corner:

3 – 7mm 50mm under 10kg load

over 7mm 30mm under 15kg load



Moisture Content

Origin™ Plywood will be dispatched from manufacture within the moisture content range of 8% -15%.

technical information and support

Moisture content and dimensional change

With all wood products moisture content varies with changes in ambient humidity. In plywood this causes the veneers to expand or shrink across the grain. For a change in moisture content between 6-18%, the dimensional change both across and along a 2400 x 1200mm panel will be between 1.3mm and 2.3mm. Once above 18% moisture content, little change occurs.

Table 5 Percentage variation in dimension* per 1% moisture content change (%)	
<i>Direction</i>	<i>Plywood (3 ply)</i>
Longitudinal	0.010 parallel to grain
Tangential	0.015 parallel to grain
Radial	0.150 thickness
* Acknowledgment - Plywood Association of Australia	

Thermal properties

Table 6 shows that the thermal insulating properties of plywood provide improved thermal insulation to walls and ceilings. Fixed to the internal face of external walls, plywood combined with a mandatory insulating layer plays a positive role in the overall insulation of the structure.

The thermal expansion of plywood is typically quite small. The average co-efficient of thermal expansion of plywood is 4.5×10^{-6} mm/mm/°C. For a typical 2400x1200mm sheet this equates to a 0.0000972mm² expansion per degree increase.

There is very little effect on plywood (veneers and glueline) when used in temperatures below 93°C, and any strength loss due to heat is recovered when the temperature is reduced. Since most conventional floor heating systems do not rise above 37°C, Origin™ Plywood is ideal as a flooring substrate.

Table 6 Thermal properties of plywood*				
<i>Property</i>	<i>Thickness (mm)</i>	<i>Density (kg/m3)</i>	<i>Value</i>	<i>Units of measure</i>
Thermal resistance *R	3	550	0.02	per m ²
	6		0.05	
	9		0.07	
	12		0.09	
Thermal conductivity k			0.13	W/m °C
* from NZS4214:1977				

technical information and support

Sound transmission

Plywood has the ability to absorb sound and reduce its transmission.

Tables 7 and 8 are a guide to the acoustic qualities of plywood.

Table 7 Sound Insulation properties of plywood*			
Application	Thickness (mm)	Sound transmission loss	Units
Single sheet	6.3	22.4	Decibels
Fixed to both sides of 100x50mm studs	6.3	31.3	Decibels

* From the American Plywood Association Publication "Plywood for Industry"

Table 8 Sound absorption properties of plywood*		
Application	Frequency (hertz)	Absorption Factor
6.3mm plywood fixed to both sides of 100x50mm studs	128	0.31
	256	0.11
	512	0.14
	1024	0.12
	2048	0.12
	Average	0.16

* From the American Plywood Association Publication "Plywood for Industry"

Design references

- Plywood Association of Australia (PAA) "Facts about Plywood".
- New Zealand Timber Use Manual published by New Zealand Timber Industry Federation.
- NZS 3603:1993 (A1, A2) Timber Structures Standard.
- NZS 3604:1999 New Zealand Standard - Timber Framed Design.
- BRANZ Appraisal Certificate No. 224 (2001) Structural Plywood Wall Bracing Systems.
- AS/NZS 2269:1994 Plywood - Structural.
- PAA literature on plywood bracing.
- Please check that the information given in this brochure has not been superseded or withdrawn.
- Technical design information for specific engineering design is available to designers.

For product use options and further technical information, please call ORIGIN toll free on: 0800 ORIGIN (0800 674 446). Or visit our Website: www.origin.co.nz

flooring, decking and roofing

Origin™ Plywood **flooring, decking and roofing** products are available in tongue and groove (T&G) profile, featuring the distinctive red tongue. Square-edged plywood can also be applied in flooring, decking and roofing installations.

T&G Origin™ Plywood provides

for easier and more efficient installation and, in most instances, will eliminate the need for sub-floor blocking. The red polypropylene tongue provides a great start to laying a solid, squeak-free floor.

Kiln dried mechanically graded pine such as Origin™ Timeframe and engineered wood solutions

such as Origin™ *I-beam*, are recommended for framing.

Origin™ Plywood **long-span** and Origin™ *I-beam* create a great flooring solution, allowing joist spacing to be maximised whilst still providing a solid, stable floor.



Framing

Joist spacings, as shown in Table 9 are based on the following:

- Plywood face grain must be laid perpendicular to supports (joists).
- Panels are laid with joints staggered (brick bond pattern) (see Figure 2).
- Square-edge sheet edges should be supported with blocking or framing.
- Load cases are from NZS 4203: 1992, Table 3.4.1 Basic Live Loads for Floors and Stairs.
- Concentrated live loads are uniformly distributed over a 300 x 300mm area, except for roofs.
- Duration of load factors $k_1 = 0.8$ and $k_2 = 1$.
- Short and long term load factors for serviceability limits, $Q_s=0.7$, $Q_L=0.4$.
- Panel moisture content is less than 18%.
- Superimposed live loads are not included.

Use spacings as detailed in Table 9 or as specified by a design engineer.

For exposed decking applications, treated (H3) Origin™ Plywood must be used.

Structural plywood should be used as a substrate for permanent weather barrier systems.

If treated plywood is specified as a substrate for rubber-membrane overlays such as Butynol, use Origin™ Plywood treated with CCA. In these applications LOSP-treated plywood must not be used as the solvents used in the treatment process will affect adhesion between plywood and the membrane.

For roofing applications supporting a thin membrane (less than 2.5mm), the minimum requirement is CD plywood. In situations where the underside of the panel is exposed to view and D-grade veneer is not acceptable, the use of Origin™ Plywood **premium** or BB is recommended.



flooring, decking and roofing

Ensure that a design engineer checks and approves the load bearing capacity when using plywood as a structural component for curved roofs.

The chosen panel thickness must relate to loading and

flexibility of the membrane.

Origin™ recommends consultation with a membrane supplier.

Framing layouts for Origin™ Plywood roofing must be in accordance with the details provided in Table 9 below.

	Roof	Assembly area	Domestic housing	Carpark, car ramp	Office and general use
Plywood thickness (mm)	Rafter spacing (mm)	Joist spacing (mm)			
7*	300				
9*	450				
12	600				
15	800	300	400		350
17	1200	300	400	300	400
19		350	550	400	500
19 <i>Long-span</i>		400	600	450	600
21		400	600	450	600
25		500	750	550	700
Mid span deflection (mm)	Span / 85	1 or Span/400	1 or Span/400	1 or Span/400	1 or Span/400
Spacial occupancy category (mm)	11.1	5.2	1.2	10.8	6.2
Uniformly distributed live load (kPa)	0.25	5	1.5	2.5	2.5
Concentrated live load (kN)	1	3.6	1.8	9	2.7
Plywood density (kg/m ³)	550	550	550	550	550

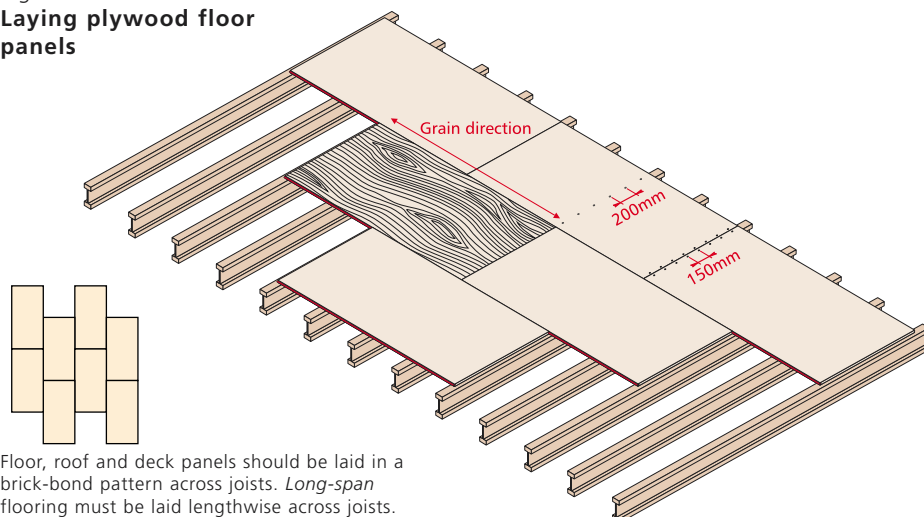
*Denotes utility applications.
For further basic live loads refer to Table 3.4.1 NZS 4203:1992, or consult a design engineer for other applications.

Sheet placement

When laying Origin™ Plywood **flooring** and **roofing** it is important that the face grain be laid at right angles to supports or cross-members; refer to Figure 2 (below).

If using Origin™ Plywood roofing (12 and 15mm) on a flat roof, it is recommended that solid blocking at 600mm centres be used to prevent ponding on the plywood surface.

Figure 2
Laying plywood floor panels



Floor, roof and deck panels should be laid in a brick-bond pattern across joists. *Long-span* flooring must be laid lengthwise across joists.

flooring, decking and roofing

Tongue and groove Origin™ Plywood should be butt-jointed with no gaps between sheet edges. Square-edged sheets laid for flooring, decking or roofing, require a 2mm-expansion gap between sheet edges.

Origin™ Plywood used for flooring and decking should have a

5mm gap left around the perimeter of the floor to allow for expansion.

If the plywood gets wet during construction, brush off any surface water to avoid ponding.

Where Origin™ Plywood is used as a structural substrate for thin membranes, sheet edges should be taped over prior to laying the

membrane. For this application, sheets must be kept dry and covered until just before the membrane is laid. To ensure adhesion to the membrane, it is important to remove all surface dust and dirt. Refer to membrane supplier instructions for specific details.

Diaphragm construction

Plywood's high shear strength makes it ideal as a medium for resisting lateral loads from earthquakes and wind. The design and construction of floors and ceilings as plywood diaphragms must comply with the requirements of NZS 3604:1999.

Fixing

- Nails or screws need to be at 150mm centres around panel edges and 200mm on intermediate supports.
- Fasteners should be no closer than 10mm from panel edges.
- Countersunk screws are recommended when fixing plywood for thin membrane roofing. Staples and nails

must not be used.

- With Origin™ Plywood treated to H3, corrosion-resistant fastenings such as type 316 stainless steel must be used to meet the 50-year durability requirements of the NZBC.

The following table provides recommendations for nail and screw fixings:

Adhesives

Gluing and screwing of Origin™ Plywood to joists and frames improves stiffness and eliminates squeaking in the finished floor. Furthermore, glue the plywood panels together by applying a bead of glue to the top of the red tongue prior to joining adjacent panels; this generates additional diaphragm bracing. Use a permanent structural adhesive.

Table 10
Origin™ Plywood nail and screw fixing schedule
(all dimensions expressed in mm)

Plywood thickness (Plies)	Fixing to timber framing		Fixing screws to steel framing	
	Flat-head galv. nails	Screws - self-drilling or countersunk	Thickness less than 2mm	Thickness over 2mm
	Expressed as: Length x Thickness Gauge x Length		Expressed as: Gauge, Thread, Length	
7 (3)	30 x 2.5	8 x 30	10-16-45	10-16-45
9 (5)*	40 x 2.5	8 x 30	10-16-45	10-16-45
12 (5)	40 x 2.8	8 x 40	10-16-45	14-20-45
15 (5)	50 x 2.8	8 x 45	10-16-45	14-20-45
17 (7)	60 x 2.8	8 x 50	10-16-45	14-20-45
19 (7)	60 x 2.8	8 x 50	10-16-45	14-20-45
21 (7)	60 x 2.8	10 x 50	10-16-45	14-20-45
25 (9)	75 x 3.15	10 x 50	10-16-45	14-20-45

Note: Screw fixings are not part of an NZS 3604 diaphragm solution.

*2700mm is 3-ply

flooring, decking and roofing

Ventilation

Lack of ventilation can lead to:

- reduced thermal insulation
- condensation
- mould growth
- product decay.

To avoid these problems, provide for air movement within the roof cavity, joist or plenum areas. If ventilation is likely to be hindered or restricted, it is recommended that Origin™ Plywood treated to H3 be used. Note that H3 treatment is not intended for use in permanently wet or ground contact areas.

Guttering

The following details are recommended when using Origin™

Plywood as a roofing substrate around gutters:

- H3 treated Origin™ Plywood is recommended for sheets that over-hang gutters
- An approved flashing must be fixed on the ends of sheets over-hanging gutters
- Gutter construction must ensure that the front (outer) edge be lower than the inside edge.

Insulation

For ground floors use either:

- Breather-type foil draped loosely over the joists, OR
- Thick insulation sheets such as fibreglass, OR
- Glue and screw plywood to the joists (to improve stiffness and eliminate squeaking), then stretch the foil under the joists and fix with thin battens.

Table 11
Effective section properties for 1m width of Origin™ Plywood structural grades

Nominal panel thickness	Effective stress parallel to face grain				Effective stress perpendicular to face grain			
	Effective area A_1	Effective moment of inertia I_1	Effective section modulus Z_1	Effective rolling shear constant I_1/Q_1	Effective area A_2	Effective moment of inertia I_2	Effective section modulus Z_2	Effective rolling shear constant I_2/Q_2
mm	mm ²	10 ³ mm ⁴	10 ³ mm ³	mm	mm ²	10 ³ mm ⁴	10 ³ mm ³	mm
4	3.0	6.4	3.0	3.0	1.3	0.4	0.3	0.9
6	3.6	16.7	5.6	4.4	2.4	1.6	1.0	1.6
7	4.8	29.8	8.3	5.2	2.4	2.0	1.0	1.6
9	5.4	48.3	10.6	7.0	3.6	14.0	4.7	3.9
12	7.2	114.0	18.9	9.3	4.8	33.2	8.3	5.2
15	9.0	223.0	29.5	11.8	6.0	64.9	12.9	6.5
17	9.6	283.0	33.3	12.1	7.2	122.0	18.8	9.3
19	12.0	450.7	46.5	13.8	7.2	156.8	21.7	10.5
19 "Long-span"	13.0	521.6	54.7	14.2	6.0	67.1	12.0	6.1
21	12.0	555.7	52.3	15.2	9.0	239.2	29.7	11.6
25	15.0	896.7	72.0	17.8	9.6	381.1	38.1	13.7

The effective section properties were calculated using the method in Appendix F NZS 3603:1993, and are based on air dry thickness of plywood veneers after processing. The above I_1 and I_2 are for stiffness calculations only.

bracing

Bracing performance

Structural Origin™ Plywood is manufactured to AS/NZ Standard 2269:1994 Plywood - Structural.

If the building is constructed in accordance with NZS 3604:1999 then the bracing ratings will be as shown in Table 12. The bracing ratings are based on wall heights of 2.4m. For heights other than 2.4m, the bracing ratings are multiplied by 2.4 and divided by the height of the wall in metres. For walls higher than 2700mm (the maximum of Origin™ Plywood sheets), it is recommended that only one horizontal joint is made and that this is made over minimum 90 x 45mm nogging with nailing of both sheet edges to this at 150mm centres. Walls that measure less than 1.8m in height should be assumed to be 1.8m in height.

The minimum grade plywood required for bracing applications is 7mm DD.

Bracing is usually untreated but treated Origin™ Plywood can be used where required by a particular application.

Higher grades and thicker Origin™ Plywood must be used when required for cladding systems where aesthetic appeal is incorporated into the design.



Table 12

Bracing Ratings per metre of element length for Structural Plywood Wall Bracing Systems

BRANZ P21 Rating*		Type	Bracing Element	BRANZ EM3 Rating*		
Wind	Earthquake			Wind	Earthquake	
90	80	SP2	7mm Structural Plywood on one face. Length 0.6 - 0.9m.	C	120	80
				T	125	80
100	110	SP1	7mm Structural Plywood on one face. Length 0.9 - 1.8m.	C	140	90
				T	140	100
130	100	BR7	7mm Structural Plywood on one face with Gib® Braceline on the other. Length 0.9 - 2.4m.	C	175	130
				T	155	95
120	105	SP12	7mm Structural Plywood on one face. Length 1.8 - 3.6m.	C	160	100
				T	155	100

Notes: C = Concrete floor, T = Timber floor.

*The P21 ratings should be used until an amendment to NZS 3604 ratifies the EM3 ratings.

Origin™ Plywood lining (12mm) can be used in place of Gib® Braceline.

Gib® Braceline will not stand exposure to the weather.

bracing

BRANZ Appraisal

Structural Origin™ Plywood conforms to BRANZ Appraisal Certificate No.224 (2001) : Structural Plywood Wall Bracing Systems. When installed and used in accordance with the Certificate, Origin™ Plywood meets the relevant provisions of the New Zealand Building Code clauses:

- B1 Structure
- B2 Durability
- F2 Hazardous Building Materials.

Framing

All sheet edges must be fixed on timber framing. It is recommended that kiln dried mechanically graded

framing such as Origin™ Timeframe is used for framing.

Use extra studs near openings. Nogging or plates must be used at top and bottom edges of panels. Excessively warped timber should be rejected. Minor bows in the studs should be placed in the same direction to give a consistent nailing surface.

It is important to apply Origin™ Plywood to framing with moisture content of 12-16% at the time of construction and that it remains dry (<18% m.c.) during its service life. Wet framing is likely to distort the plywood during the natural drying process.

It is recommended that plywood be allowed to “condition” to ambient humidity prior to fixing over framing, especially framing that has been wet during construction.

Where cladding or lining materials are going to be fixed over the plywood bracing, the timber framing may be rebated to accommodate the plywood. 12mm Origin™ Plywood cladding is ideal for the exterior of houses, with studs at 600mm centres.

When using square edge sheets over framing, add 1 to 2mm to stud spacings to allow for slight sheet swelling.

Table 13
Recommended maximum stud spacings

Plywood Thickness (mm)	Frame spacing when sheets are fixed in residential or office buildings (mm)	
	Along framing*	Across framing**
7	240	480
9	400	600
12	600	900
15	750	1050
17	900	1200
21	1200	1200

* Along framing is when sheets are applied vertically to studs.
** Across framing is when applied horizontally to studs.

Table 14
Origin™ Plywood 7mm bracing for dry internal applications

Application	Plywood Treatment	Fixings
Plywood bracing on internal wall	Untreated	Galvanised fixings
Plywood bracing on inside face of external wall	Untreated	Galvanised fixings
Plywood bracing behind brick veneer cavity	Untreated and covered with building paper	Galvanised fixings
Plywood bracing on the dry side of the cavity behind stucco plaster on a non-rigid backing	H3 and covered with building paper	Stainless steel or the silicon bronze fixings
Plywood bracing also acting as wind barrier behind any cladding	H3 and covered with building paper	Stainless steel or silicon bronze fixings
Plywood bracing behind claddings where NZS 3604 does not require a wind barrier	Untreated and covered by building paper	Galvanised fixings

Note that drainage cavities must not be open to the subfloor or roof spaces.

Building paper

Building paper must meet the requirements for a non-rigid cladding underlay given in Table 11 of NZS 3604:1999. It must pass the AS/NZS 4201.4:1994 resistance to water penetration test and in addition have a durability of 50 years. Building paper is a requirement over untreated and treated plywood bracing to meet the durability requirements of BRANZ Appraisal Certificate, No. 224 (2001). Install building paper in accordance with manufacturers instructions.

Fasteners

The bracing ratings given in Table 12 apply when the structural plywood is fixed to timber frames using either:

- 30 x 2.5mm galvanised clouts
- 40 x 2.5mm galvanised clouts
- 40 x 2.8mm Grade 316 stainless steel annular grooved nails
- 40 x 2.8mm silicon bronze annular grooved nails

For treated plywood, use the silicon bronze or stainless steel options.

bracing

Fixing plywood

Refer to Figures 3-6; bracing details.

Fix nails at 150mm centres around the perimeter of each plywood panel and 300mm centres to intermediate studs and nogs. Nails should be no closer than 10mm from panel edges.

Nail popping is rarely a problem with plywood. The risk of nail popping and sheet distortion can be further minimised by using kiln dried mechanically graded pine such as Origin™ Timeframe.

It is recommended that during installation a 2mm expansion gap is provided between each sheet of square-edge plywood. Exceptions to this are T&G and ship-lap edge profiles; these should be butt-jointed over dry framing.

Plywood must be installed and maintained at a minimum 100mm above concrete or cobblestones and 150mm above grass or gardens.

It is recommended that the bottom edge of exterior plywood be sealed with an appropriate paint system to guard against moisture uptake and swelling. Ensure that the sealer and finish paint system are compatible.

Bending performance

To achieve the bending performance shown in Table 16 below, it is a requirement that fastenings be placed at 150mm centres on all frames and that the fastener sizes described on page 18 be applied.

Stucco plaster finishes

Origin™ Plywood comes in a wide range of thicknesses, allowing it to fully support stucco finishes; refer table 15.

Thicker plywood provides extra stiffness and stability, helping to reduce problems such as cracking and buckling of the plaster as it dries.

Stainless steel (type 316) nails must be used with H3 treated plywood under stucco plaster finishes.

It is very important that Origin™ Plywood square-edge sheets be fixed with a 3mm gap between sheets where stucco plaster is to be applied; refer figure 18.

In accordance with NZS 4251, a breather type building paper must be fixed between the plywood and the plaster. Apply the plaster according to instructions of the plaster manufacturer.



Table 15
Recommended maximum framing spacings for plywood under stucco plaster

Thickness (mm)	Spacings when sheets are fixed (mm)	
	Along framing*	Across framing**
9	n.a.	400
12	400	600
15	600	900
17	750	1000
21	900	1200

* Along framing is when sheets are applied vertically to studs.

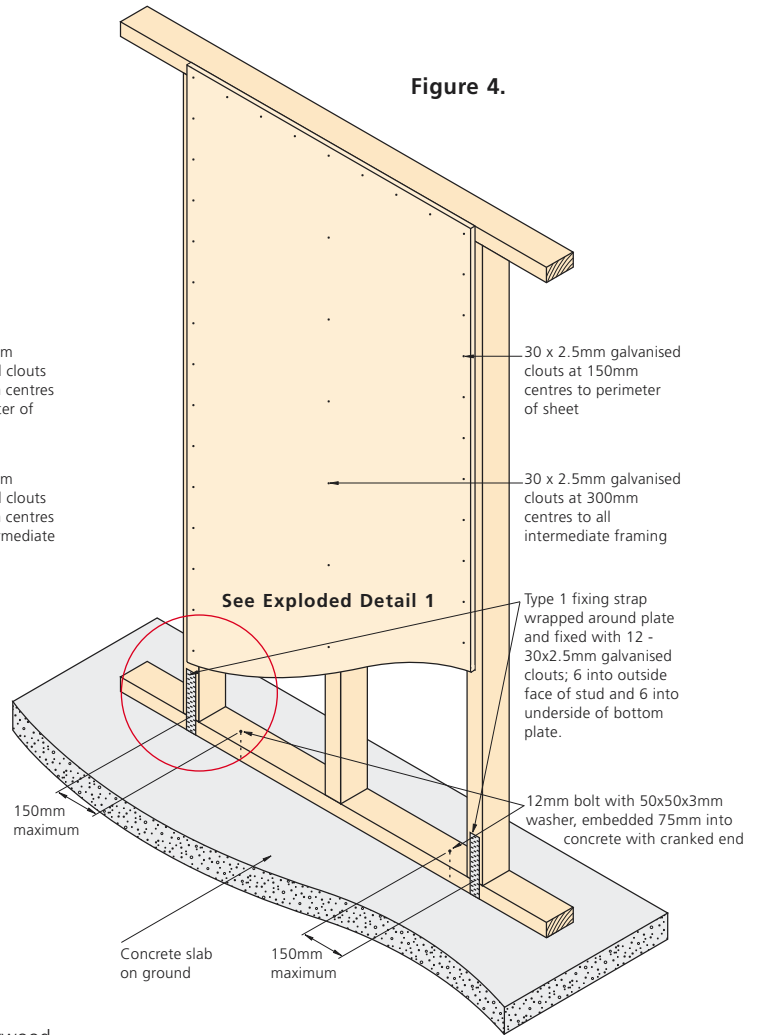
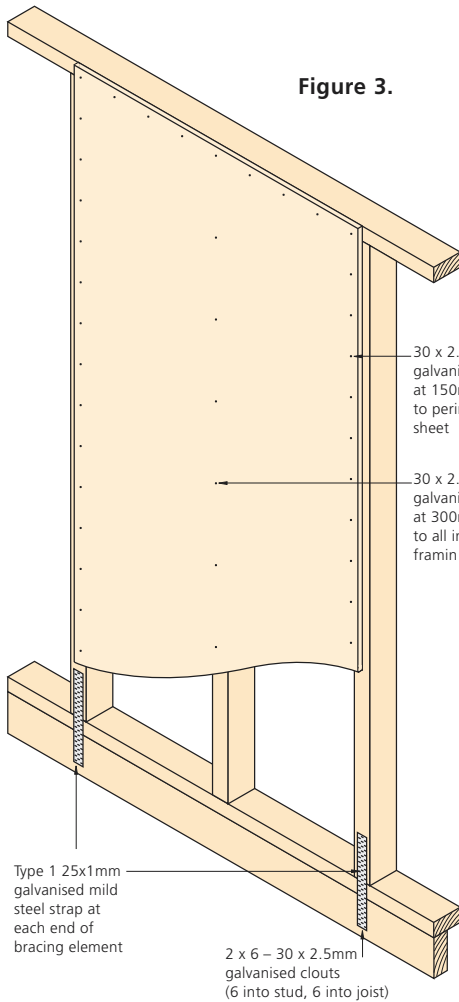
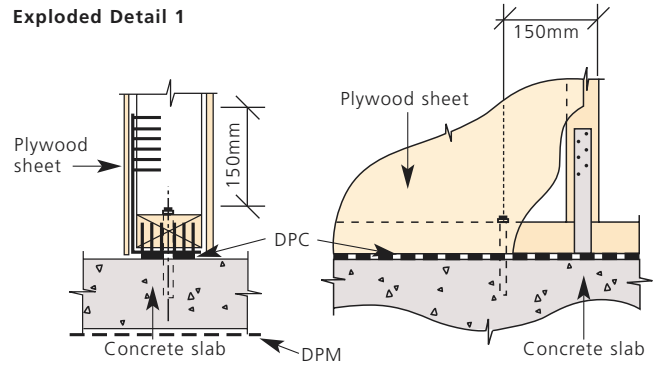
** Across framing is when applied horizontally to studs.

Table 16
Origin™ Plywood structural bending performance

Thickness (mm)	7	9	12	15	17	21
Curve radius along face (m)	1.6	2.0	4.5	5.0	6.0	8.0
Curve radius across face (m)	0.6	1.7	2.2	3.0	4.5	6.0

bracing details

Exploded Detail 1



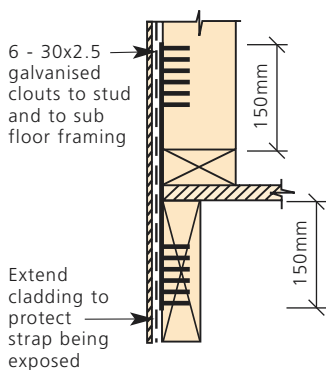
Notes: Figures represent fixing of 7mm untreated plywood.

Where the galvanised straps protrude into the subfloor space, additional corrosion protection is required, refer BRANZ Appraisal Certificate No. 224 (2001) for details.

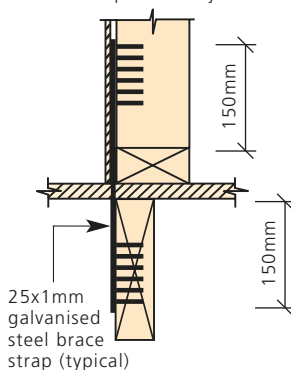
With H3 treated plywood stainless steel straps must be used and either 40x2.8mm grade 316 stainless steel annular grooved nails or 40x2.8mm silicon bronze annular grooved nails must be used in lieu of the 30x2.5mm galvanised clouts shown.

End stud fixing details

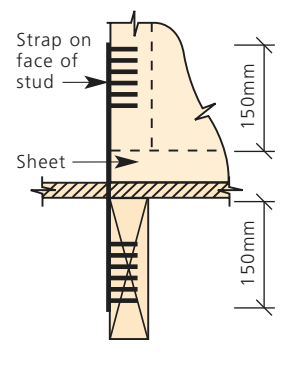
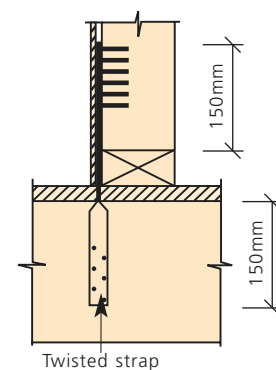
Exterior cladding over plywood sheet



Internal detail over continuous floor - wall parallel to joists



Internal detail over continuous floor - wall across joists



bracing details

Figure 5.

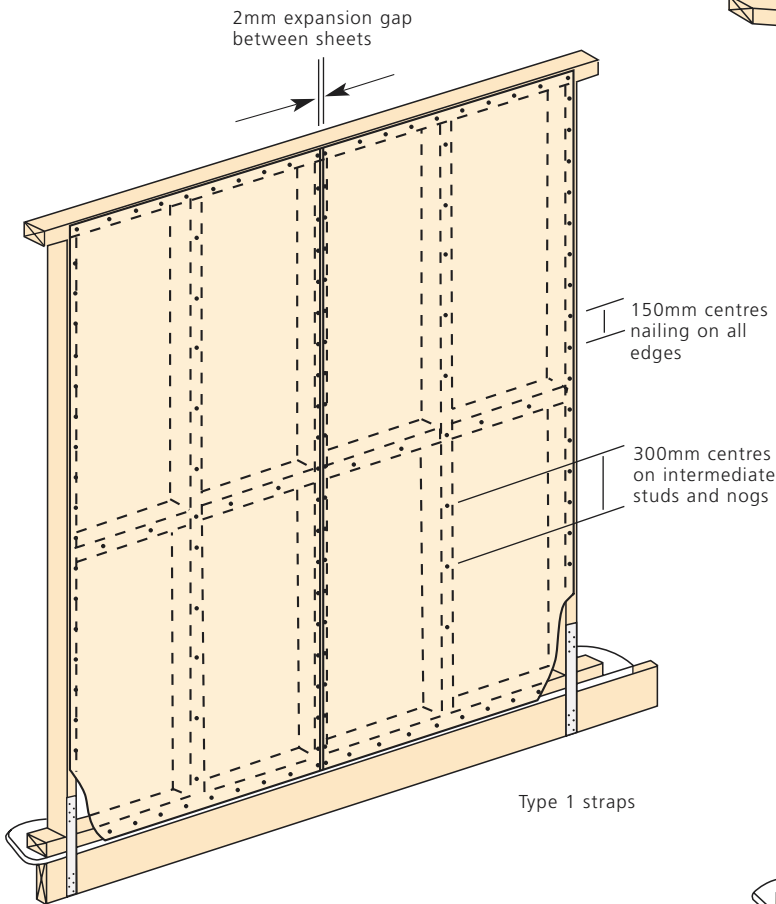


Figure 6.

Bracing wall higher than plywood sheet length

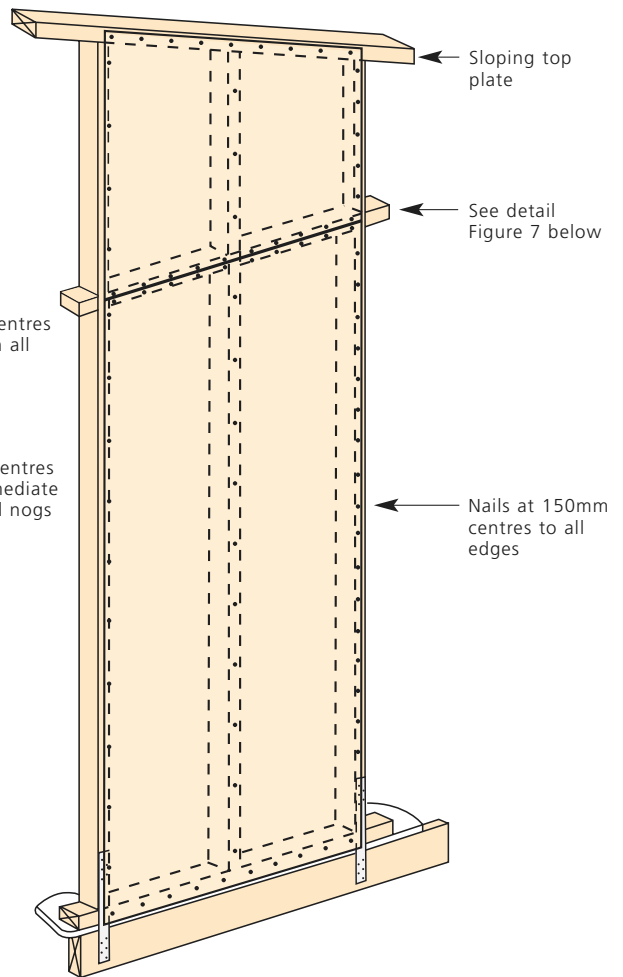
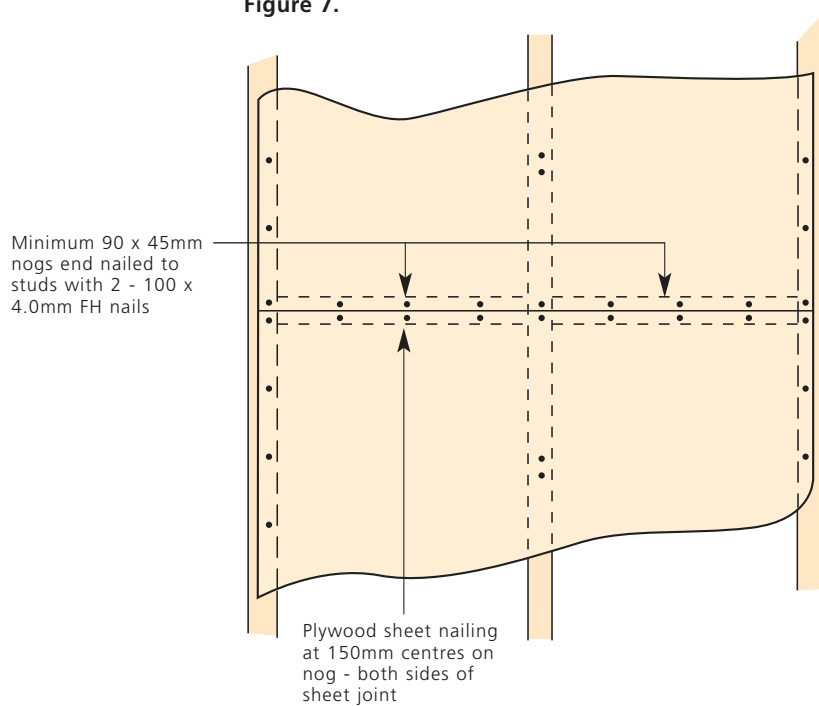


Figure 7.



Notes: Refer to page 18 for nailing options.

bracing details

Figure 8.
Sheet brace under brick veneer

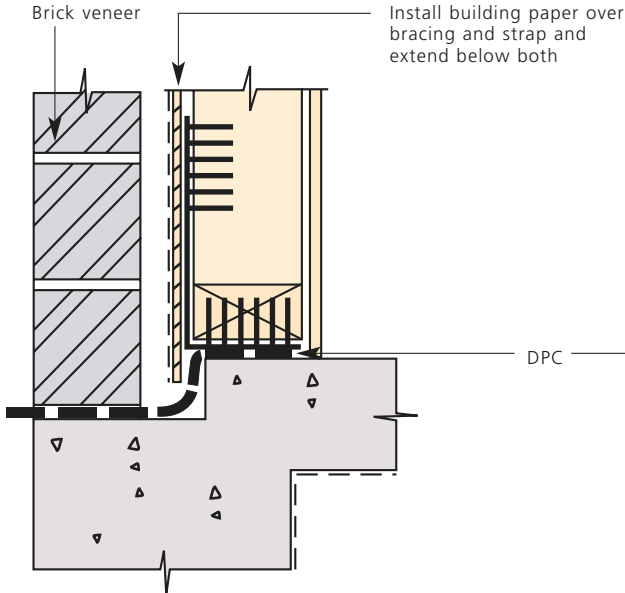


Figure 9.
Sheet brace under cladding

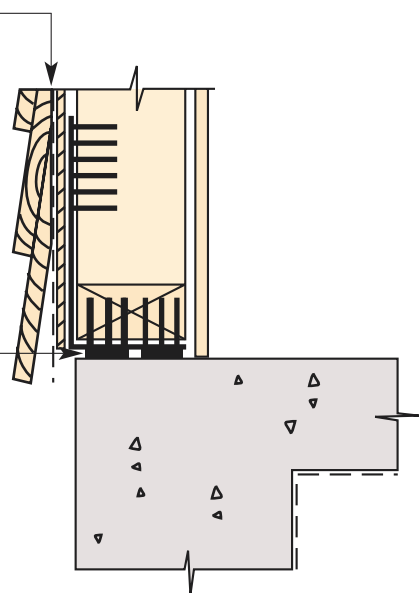


Figure 10.
Plywood sheet as internal lining

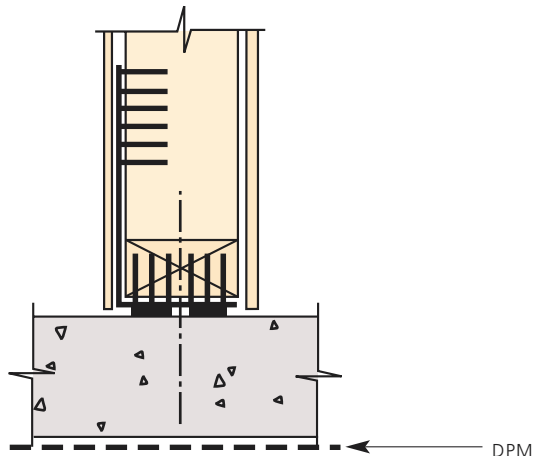
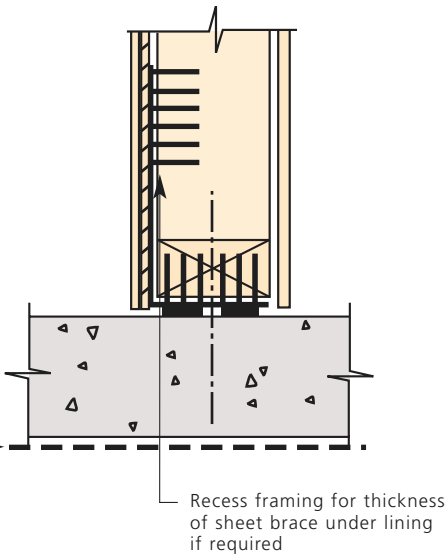


Figure 11.
Plywood sheet under internal lining



Note: Plywood under stucco or a non-rigid backing - similar to brick veneer except plywood must be H3 treated.

specific design of shear wall panels

Plywood shear wall panels may be subject to specific design. In this case NZS 4203:1992 should be used to determine the design loads and design may be undertaken by using the Timber Structures Standard NZS 3603:1993 together with the fastener load/slip data obtained from BRANZ tests which are given below.

Cyclic load slip tests were carried out on four different fastener types and the resulting data for the first and third cycle load peaks was found to conform to the following equation:

$$P = \frac{Ae}{B + Ce^D}$$

Where

P = load (kN)

e = displacement at load P
(mm)

A, B, C, D = constants from Table 18

Table 17

Load Slip Constants

Fastener type	Constant A		Constant B		Constant C		Constant D	
	First cycle	Third cycle	First cycle	Third cycle	First cycle	Third cycle	First cycle	Third cycle
1	1.43	1.14	0.25	0.28	0.59	0.46	0.94	1.14
2	1.29	1.05	0.12	0.16	0.70	0.57	0.84	1.04
3	1.34	1.19	0.33	0.46	0.60	0.42	0.88	1.13
4	1.21	1.23	0.67	0.83	0.39	0.38	1.12	1.31

Fastener type:

1. 30 x 2.5mm galvanised clouts
2. 40 x 2.5mm galvanised clouts
3. 40 x 2.8mm Grade 316 stainless steel annular grooved nails
4. 40 x 2.8mm silicon bronze annular grooved nails

For earthquake loads use the third cycle results.

For wind loads use the first cycle results.

cladding and lining

Cladding and lining

Origin™ Plywood **cladding** and **lining** products are provided in 12mm 5-ply lay-up to ensure stability in service. They are engineered to combine an attractive, decorative appearance with bracing capability.

In accordance with AS/NZS 2269:1994, Origin™ Plywood **cladding** and **lining** products feature permanent phenolic glue bonds between each layer of veneer.

Origin™ Plywood **cladding** and **lining** products are supplied in two grades:

- **Classic - Superior quality “A-B” face with natural features that create a refined wood appearance.**

- **Pioneer - Regular quality face with minor natural features that provide a rustic appearance.**

Origin™ Plywood **cladding** products are preservative treated with LOSP to meet the durability requirements of the New Zealand Building Code.

To maximise the service life of Origin™ Plywood **cladding**, it is important to apply and properly maintain an approved three-coat paint system, preferably in a light colour to reduce wood fibre movement. It is recommended that cladding be left exposed to the elements in-situ for a minimum of three weeks prior to application of the paint finish.

When painting Origin™ Plywood **cladding**, it is important that faces and all edges be sealed. This minimises moisture uptake that could otherwise lead to distortion and checking of the cladding. If edges are cut prior to installation, they must be sealed after cutting.

Mould spores occur naturally in the environment and can form unsightly staining on plywood. To prevent this, plywood arriving on site must be kept clean and dry prior to installation. When used in external applications it should be coated with appropriate paints or stains; further protection will be provided by using paint systems containing mouldicide.

Refer to page 8: Finishing.

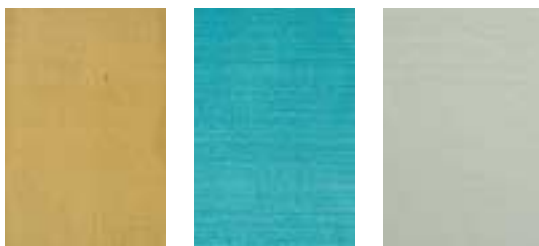
Grades and finishes

Grade: Classic (BX)

Natural

Stained

Painted



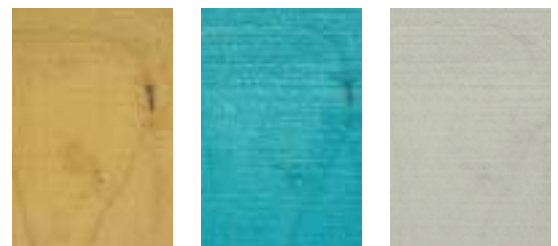
Same sample used for all 3 photographs.
Sample size: 590 x 400mm

Grade: Pioneer (BX)

Natural

Stained

Painted



Same sample used for all 3 photographs.
Sample size: 590 x 400mm

Table 18
Recommended fixing schedule for Origin™ Plywood cladding and lining

Cladding and Lining thickness (mm)	Frame spacing when sheets are fixed in residential or office buildings (mm)		Centres for fasteners (mm)	
	Along framing*	Across framing**	Edge	Intermediate
12	600	900	150	300

* Along framing is when sheets are applied vertically to studs.
** Across framing is when applied horizontally to studs (not recommended for exterior cladding).

cladding and lining

Table 19

Product specifications for Origin™ Plywood Cladding and Lining

Product code*	BGX-24	BX-24	SGX-24	SVX-24	SVI-24
	BGX-27	BX-27	SGX-27		SVI-27
Face finish	Band-sawn	Band-sawn	Smooth	Smooth	Smooth
Face profile	Channel grooves at 150mm centres, 6.0mm deep x 9.5mm wide	Band-sawn	Channel grooves at 100mm centres, 6.0mm deep x 9.5mm wide	V-grooves at 100mm centres, 1.5mm deep x 3.0mm wide	V-grooves at 100mm centres, 1.5mm deep x 3.0mm wide
Edge profile	Ship-lap and weather groove	Ship-lap and weather groove	Ship-lap and weather groove	Grooved with plastic tongue	Grooved with plastic tongue
Available lengths	2440mm	2440mm	2440mm	2400mm	2400mm
	2745mm	2745mm	2745mm		2700mm
Thickness	12mm	12mm	12mm	12mm	12mm
Width	1216mm	1216mm	1216mm	1207mm	1207mm
Cover	1200mm	1200mm	1200mm	1200mm	1200mm
Treatment	LOSP H3 clear	LOSP H3 clear	LOSP H3 clear	LOSP H3 clear	Not treated
Grades	Classic	Classic	Classic	Classic	Classic
	Pioneer	Pioneer	Pioneer	Pioneer	Pioneer
Intended application	Exterior	Exterior	Exterior	Exterior	Interior

*** Key to product codes**

Face finish
B: band-sawn
S: smooth

Face profile
G: channel grooved
V: V-grooved

Application
X: exterior (H3 treated)
I: interior (standard)

Framing moisture content

Origin™ Plywood cladding **must** be installed on framing with moisture content between 12-16%. Outside of this range, framing can be subject to dimensional change relative to moisture content; this will cause distortion in the plywood panel.

Fastenings

Origin™ Plywood **cladding** should be fastened with hot-dip galvanised flat-head nails or similar counter-sunk screws. Type 316 stainless steel fasteners must be used in applications exposed to sea air or where cladding is used as a bracing element.

Origin™ Plywood **lining** should be fastened with 40x2.0mm panel pins.

If using glue application, an elastomeric construction adhesive is recommended in conjunction with nailing at 150mm centres around sheet edges and 300mm centres on intermediate studs and nogs.

Fastenings must be fixed at a minimum of 10mm from sheet edges; exceptions are:

- fasten under-laps along weather-groove to stud
- do not fasten through top-lap
- do not fasten through the T&G edge in Origin™ Plywood **lining**
- fix sheets independently from each other
- commence installation from a corner, with panels placed so that edge laps face away from prevailing winds.

Flashings

Flashings should be placed over the lower sheet. For the sheet above, place building paper over the flashing.

A gap of approximately 5mm should be allowed between the bottom of the sheet and the flashing to compensate for frame movement and drainage, and to avoid trapping moisture.

On corner joints and joints between the square edge of the sheets, use mouldings or flashings; refer figures 14-16.

Metal finishings should be protected from timber preservatives by a suitable paint coating or similar.

cladding and lining profiles

BGX - classic grade shown



BX - pioneer grade shown



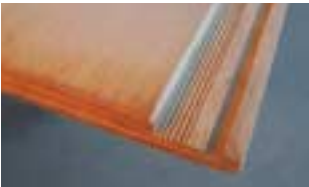
SGX - classic grade shown



SVI and SVX - classic grade shown



Exterior cladding ship-lap edge profile



Interior lining T&G edge profile (same for SVX)



cladding and lining

The following are proper fixing details of Origin™ Plywood cladding and lining:

Figure 12.
Overhangs and ground clearances

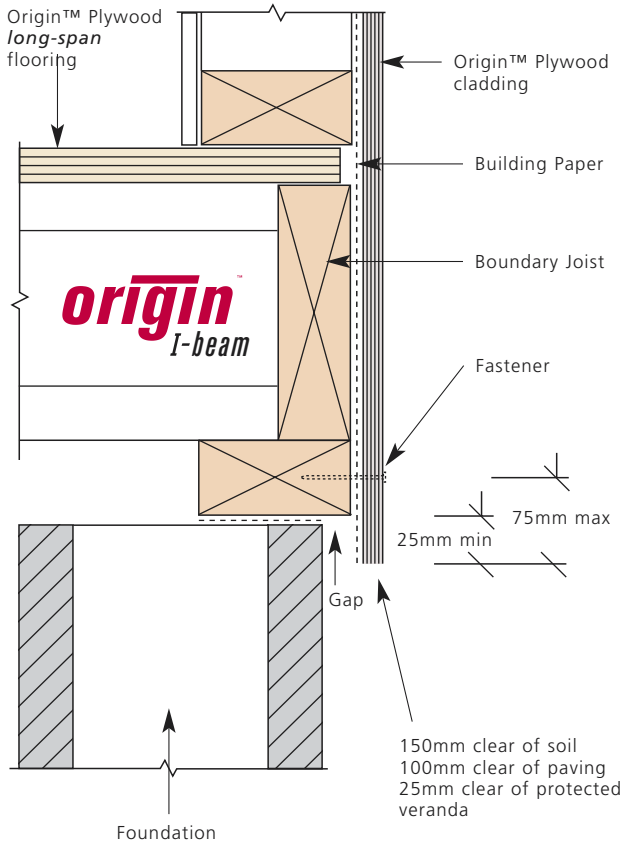
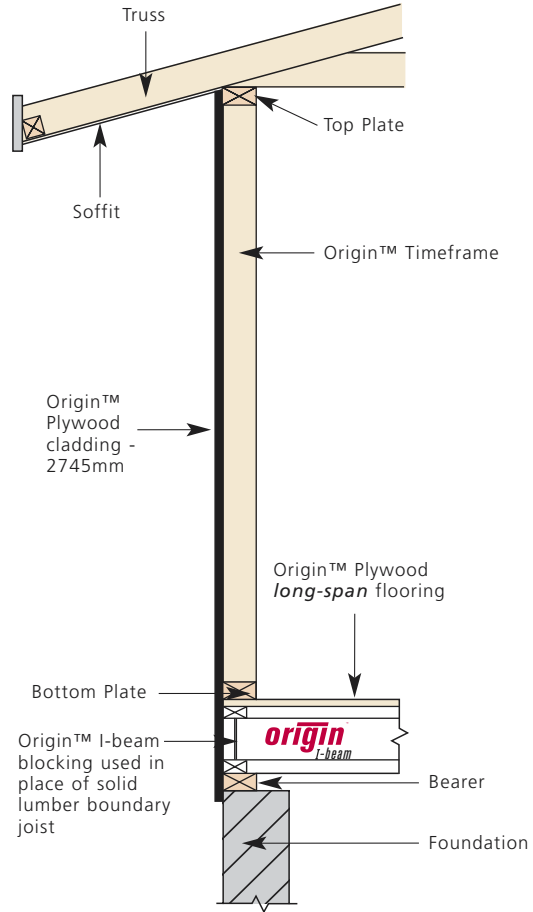
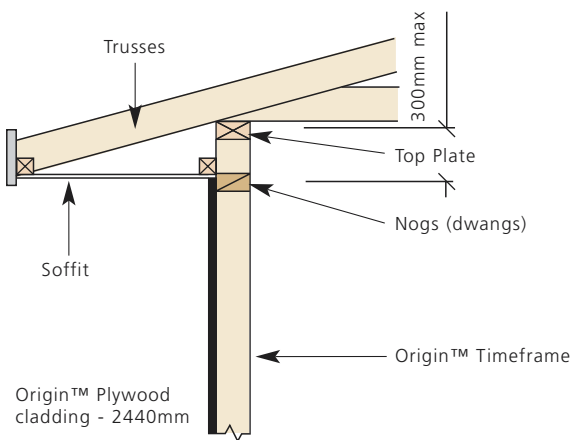


Figure 13.
Wall sections



(A) 2745mm SHEET



(B) 2440mm SHEET

Note

Origin™ *I-beam* shown must be H1 treated if used closer than 600mm above ground level.

cladding and lining

(All views shown top-down)

Figure 14.
Typical Stud Fixing Detail

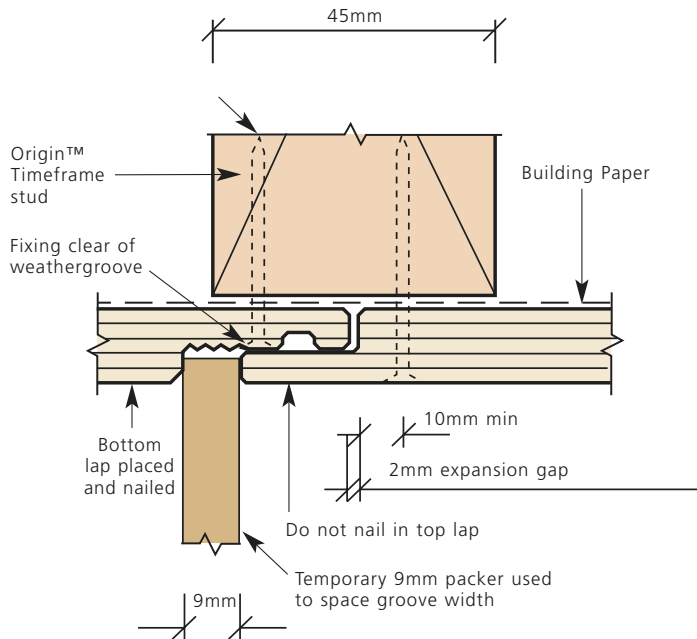
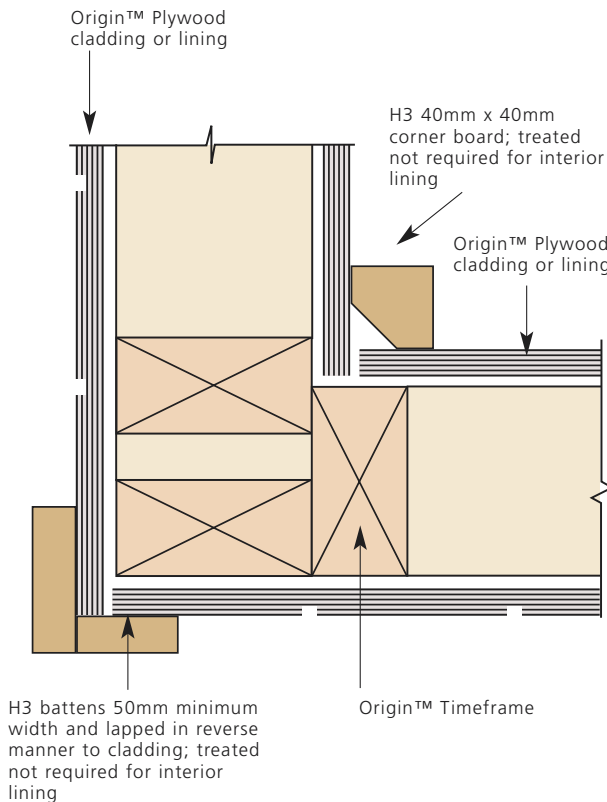
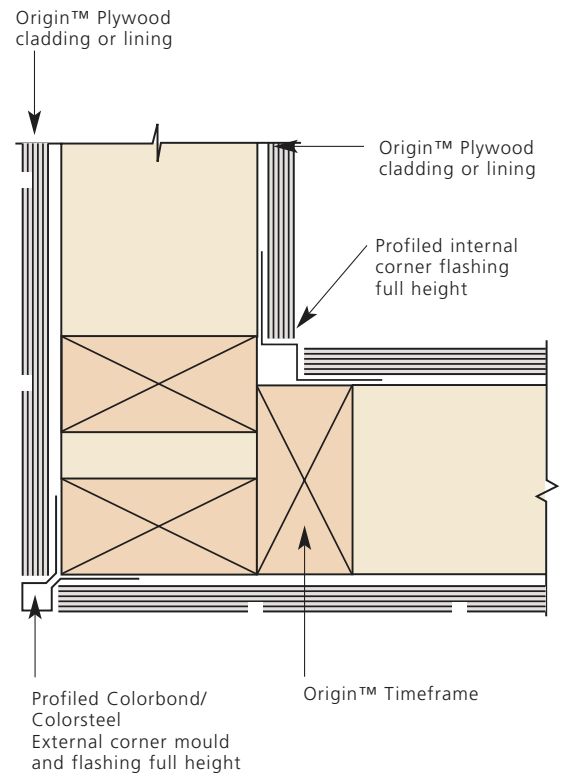


Figure 15.
Vertical Joints (Apply building paper and insulation as required)
(a) Timber mouldings



(b) Steel flashings



Note: PVC, aluminium or other proprietary products may be substituted for steel.

cladding and lining

Figure 16.
Horizontal Joints

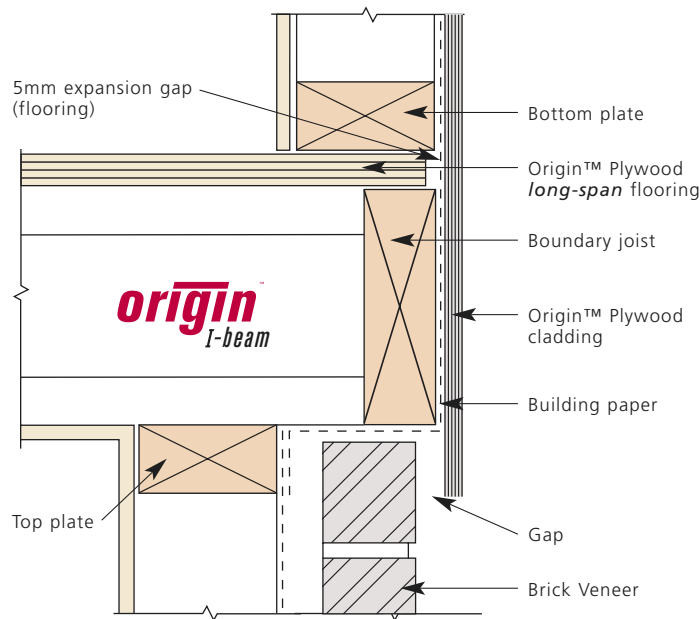
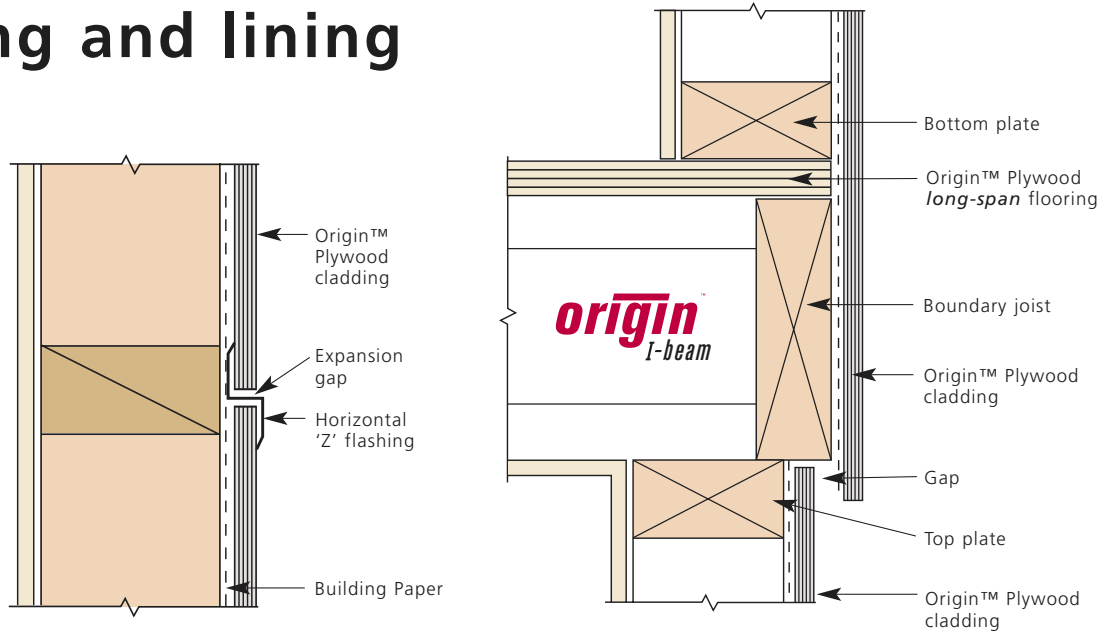


Figure 17.
Protecting cladding from moisture and soil entrapment

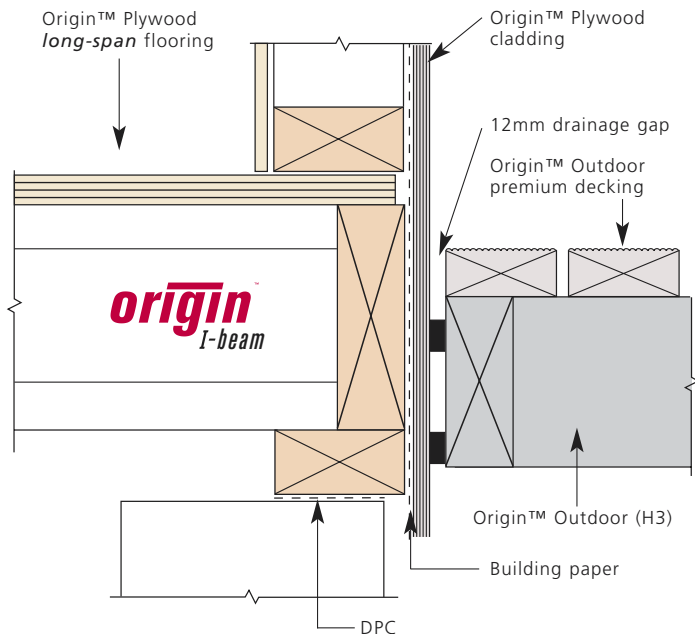
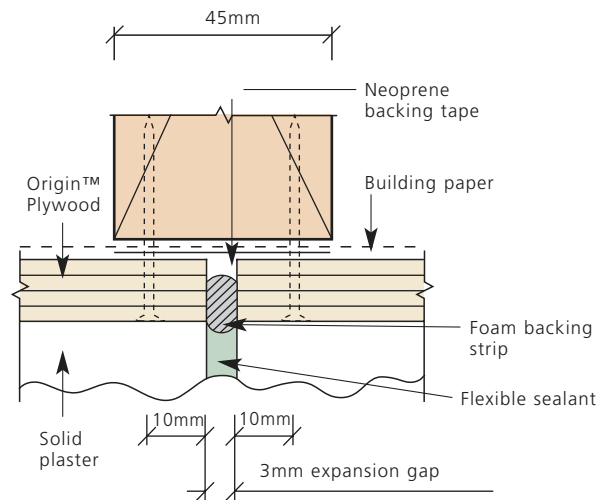


Figure 18.
Solid plaster joints (Top-down view)



frequently asked questions about plywood

The following details provide brief answers to the most frequently asked questions posed to the Origin™ Plywood customer services team. As the answers summarise the main points, it is recommended that readers refer to the pages noted after each answer for a complete explanation.

Q: *Can untreated plywood be used under rubber membranes in exterior applications?*

A: Suppliers of rubber membrane systems often specify CCA-treated plywood for use as an underlay – this ensures the plywood will not be damaged should leaks occur in the membrane. LOSP-treated plywood must not be used as the solvents in the preservative will affect adhesion between the plywood and the membrane. Untreated plywood can be used in this application but water ingress must be prevented. (Refer page 13).

Q: *What are the nailing centres for plywood bracing?*

A: Fix nails at 150mm centres around the perimeter and 300mm centres on intermediate supports for plywood bracing. (Refer page 19).

Q: *How long can plywood be left exposed to the weather during construction?*

A: Standard (untreated) Origin™ Plywood will maintain its structural integrity for up to three months under normal construction conditions. It is important to minimise ponding of water on plywood during construction. Some yellowing and surface checking may occur if left unprotected. (Refer page 7 and 8).



Q: *Can I paint or seal untreated plywood and still use it outside?*

A: Preservative treatment of plywood is the only means of guaranteeing the long-term durability in exposed external applications or where the moisture content will regularly exceed 18%. However, if it can be guaranteed that the plywood remains dry, for instance encapsulating it in fibreglass, then a standard (untreated) product shall suffice. (Refer page 8).

Q: *Can plywood cladding be left unpainted?*

A: Origin™ Plywood cladding is LOSP preservative treated to ensure long-life in exterior, out-of-ground contact applications. It is recommended that a three-coat acrylic paint system be applied to plywood cladding to prevent staining from natural mould spores and to minimise checking of the surface veneer. (Refer pages 8 and 24).

Q: *What preservative treatments are available for plywood?*

A: Treated Origin™ Plywood provides H3 level protection for applications that are out of ground contact. Two types of treatment are available:

- CCA – green in colour, based on a copper-chrome-arsenic formulation. Recommended for non-appearance applications and industrial situations.
- LOSP – clear in colour, based on a light organic solvent formulation. Recommended for appearance applications. (Refer pages 3 and 8).

Q: *What types of glue are used in plywood?*

A: The Origin™ Plywood product range includes two glue types:

- A-bond – phenol formaldehyde (PF) resin that is designed for structural applications. It is a thermosetting glue that will not deteriorate under stress of wet, heat or cold. Dark red / brown in colour. (Refer page 3).
- D-bond – urea formaldehyde (UF) resin that is designed for use in interior, dry applications. White or opaque in colour.

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Q: *What expansion should be allowed for in plywood that might get wet during construction?*

A: The lay-up of plywood with successive layers of veneers glued at right-angles to each other, provides a very stable structural product even when it gets wet. Typically, a 2400x1200mm sheet of plywood will swell between 1.3mm and 2.3mm both across and along the sheet. When using T&G flooring, it is recommended that a 5mm-expansion gap be allowed around the perimeter of the floor.
(Refer pages 11 and 15).

Q: *What standards govern plywood production?*

A: The most important standard for plywood production is AS/NZS 2269:1994 Plywood – Structural.
Furthermore, the Plywood Association of Australia (PAA) Process Quality Control Programme assures the quality of Origin™ Plywood as an independent quality assurance system.
(Refer page 2).

Q: *What grades of veneer are available on plywood faces?*

A: A Clear wood grain and limited natural features. (Origin™ Plywood Classic cladding and lining.)
B Attractive wood character with minor features blended with uniform wood grain.
C Displays the true nature of wood with sound natural features and distinctive wood grain.
D Non-appearance face.
(Refer pages 6-7, table 1).

Q: *What is marine ply?*

A: Marine plywood is the same as structural plywood except that the veneer grades are much higher, eliminating all core gaps and defects. The glue line is exactly the same in structural plywood as for marine ply. Marine ply is very rarely treated as it is usually coated with resin, fibreglass or paint finish for long-term durability. Treated structural plywood has greater durability because of the CCA treatment.
(Refer pages 15).

Q: *What filler do I use to plug nail holes in plywood?*

A: Common wood fillers can be used with plywood, but it is important to consider the durability

requirements of the application, e.g. an epoxy filler or similar is recommended for exposed flooring. Ensure the filler is compatible with the coating system to be applied over the plywood.
(Refer page 8).

Q: *How close to the plywood sheet edge can I nail?*

A: All fastenings should be fixed no closer than 10mm from sheet edges.
(Refer page 15).

Q: *Is Origin™ Plywood guaranteed for 50-years in construction applications?*

A: Structural Origin™ Plywood is guaranteed to meet the structural performance and durability requirements of the New Zealand Building Codes. The Code requires flooring and bracing to provide a 50-year service life, and cladding to provide a 15-year service life.
Treated Origin™ Plywood shall remain free of insect and fungal attack for 50 years if used and installed in accordance with this handbook and NZS 3604:1999.
(Refer page 8).



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Q: *What grade of plywood is recommended for temporary site hoarding?*

A: The minimum structural grade suitable for temporary fencing is DD. If the fencing is expected to be used for more than 3-months, then DD treated to H3 should be used. (Refer page 7).

Q: *Do I use nails or screws to fasten plywood to posts?*

A: Origin™ recommends that screws (self-drilling or countersunk) be used in this application. Flat-head nails can be used but may be subject to “pulling” should the posts swell and contract. (Refer pages 8 and 15).

Q: *Does plywood emit formaldehyde vapour?*

A: Plywood has the lowest formaldehyde emissions of any wood-based panel product and well below the international E1 standard for housing application. (Refer page 1).

Q: *What is the weight of plywood?*

A: The approximate density of Origin™ Plywood is 550 kg/m³ for all types and sizes. (Refer pages 2 and 11).



Q: *Can I nail plywood to wet framing?*

A: Wet framing will shrink and move as it dries out. To prevent distortion in plywood during the dry-out process, it is required that framing be 12-16% moisture content when the plywood is fixed. (Refer pages 3, 8 and 18).

Q: *What plywood do I use for:*

- a tree-hut

A:

H3-treated CD, DD, or cladding (depending on the desired finish effect).

- drawer bottoms

Origin™ Plywood furniture grade; 3mm or 4mm.

- a mailbox

Depending on aesthetic considerations, treated BD or cladding.

- decking on trailers

Treated BD or CD to provide a smooth finish.

- skateboard ramps

Treated BD or CD to provide a smooth finish.

(Refer page 7).

Q: *Can plywood be used in a structural diaphragm?*

A: Plywood provides an effective diaphragm solution when designed and constructed in accordance with NZS 3604:1999. (Refer page 15).

Q: *What nailing pattern should I use for Origin™ Plywood cladding?*

A: It is recommended that flat head galvanised nails or similar countersunk screws be fixed at 150mm centres around the perimeter and 300mm centres on intermediate supports. If the site is exposed to sea air, stainless steel fasteners must be used. (Refer page 25).

Q: *How should plywood be used to maximise its stiffness properties?*

A: Structural plywood has greatest stiffness along the long-grain of the sheet, i.e. along its length (not across its width). Accordingly, flooring and roofing must be laid across joists. If cutting plywood for shelving, the long-grain should be used between shelf supports. (Refer page 14).

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Q: What sealants can be painted over and be used with treated plywood?

*A: Co-polymer sealants can be painted over and are compatible with treated plywood, both CCA and LOSP. Silicon sealants are not recommended in these applications.
(Refer page 24).*

Q: What fasteners should be used with CCA-treated plywood under rubber membranes?

*A: Stainless steel screws should always be used with CCA-treated plywood.
(Refer page 15).*

Q: Can plywood be fixed directly to concrete surfaces?

*A: Yes, plywood can be directly glued to concrete surfaces that are fully cured, have been thoroughly cleaned and are free of dampness. T&G plywood laid with staggered joints is recommended. Contact glue suppliers for details of appropriate flexible adhesives.
(Refer page 14).*

Q: What is the recommended sub-floor installation for laying ceramic tiles over plywood?

*A: Use 19mm plywood over joists at 400mm centres. If using 600mm joist centres, a tile underlay board should be laid over the finished plywood.
(Refer page 14).*

Q: What thickness should be used for new decks and to cover existing decks?

*A: It is important to consider joist spacing, condition of existing decking, and the relative stiffness required. As a general rule, the thicker the plywood the stiffer the deck.
(Refer page 14, table 9).*

Q: Are there situations where CD plywood should be used instead of DD roofing plywood?

A: If plywood is to be used as a substrate to a thin membrane (<2.5mm), then CD T&G plywood is recommended. Consider using Origin™ Plywood

*BB-grade where the underside of the plywood is exposed to view.
(Refer page 13).*

Q: If CD plywood flooring has been specified, can Origin™ Plywood Long-span be used?

*A: Origin™ Plywood 19mm long-span flooring provides equivalent stiffness to 21mm plywood. The D-filled face has no effect on sheet stiffness.
(Refer page 3).*

Q: How do I identify the grade of plywood?

*A: To identify the grade of Origin™ Plywood, refer to details on the packet label and see the colour band on the end of the sheet.
(Refer pages 6 and 7).*

Q: Do I have to re-treat cut edges of treated plywood?

*A: It is important to re-seal any cuts or machining profiles made in treated plywood with brush-on remedial treatments.
(Refer pages 8 and 24).*





FLETCHER CHALLENGE
FORESTS

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