TECHNICAL NOTE
Not all Plywood is created equal

October 2025

PRODUCT NAME: Ecoply Square Edge and Flooring

INTRODUCTION:

There is a common misconception in-market that all plywood products of the same nominal thickness (e.g. 12mm or 19mm plywood), manufactured to AS/NZS 2269.0 are the same and can be substituted with minimal significant difference in performance.

Whilst face grade specification, i.e. CD, is an important consideration, the structural characteristics of the plywood panel form the most important part of the specification and consist of the Stress (or 'F') grade, i.e. F11/F8; and the Identification (ID) Code, i.e. 19-30-7.

Furthermore, some plywood products available in the New Zealand market are only stress graded in the parallel direction, e.g. F8/-. This means that structural testing has not been completed perpendicular to the grain which may also affect the overall structural performance.

This Technical Note discusses the effects of substitution and performance-based plywood products.

PLYWOOD STRENGTH AND STIFFNESS

Most plywood panels specified in residential and commercial applications are serviceability (deflection) dependent, meaning their performance is a direct function of rigidity, $E.I_{par}$ where:

- Modulus of Elasticity (E) is a function of the product of stress grade (e.g. F11); and
- Moment of Inertia (I_{par}). I_{par} is a function of the layup of the veneers which is detailed in the ID code (e.g. 19-30-7) and can vary considerably from different suppliers.

When considering substitution of products of the same F Grade, where the E is constant, the overall performance of the plywood panel in question can be directly attributed to the I_{par}. The ID Code/Construction is, in many cases, more important than the stress grade.

As an example, two standard AS/NZS 2269.0 constructions for 19mm, both F11, one using a thinner face veneer, 19-09-9, the other the standard CHH Ply construction, 19-30-7 were compared.

Table 1. AS/NZS 2269.0 Structural Properties for two alternate ID Codes.

Nominal thickness mm	Identification code	Face grain parallel to span		Face grain perpendicular to span	
		Moment of inertia (I_{par})mm^4/mm	Section modulus (Z_{par})mm^3/mm	Moment of inertia (I_{perp})mm^4/mm	Section modulus (Z_{perp})mm^3/mm
19.0	19-30-7	450.0	46.5	155.0	21.5
19.0	19-09-9	290.0	29.0	325.0	36.5

Table 2. ID Code and relative nominal veneer layup

Nominal thickness mm	Identification code	Nominal thickness of individual plies through assembly, mm
19.0	19-30-7	3.0/2.4/3.0/2.4/3.0/2.4/3.0
19.0	19-09-9	0.9/2.5/2.5/2.5/2.5/2.5/2.5/2.5/0.9

Based on structural properties alone, noting that plywood products are designed to be used with face grain parallel to the span, the relative stiffness of the two abovementioned 19mm products is significantly different.

19-30-7 F11 Plywood

$$E.I_{par} = 10{,}500 \times 450.0 \times 1000$$
$$E.I_{19-30-7} = 4.73 \times 10^9\ Nmm^2$$

19-09-9 F11 Plywood

$$E.I_{par} = 10{,}500 \times 290.0 \times 1000$$
$$E.I_{19-09} = 3.05 \times 10^9\ Nmm^2$$

When considering the performance of these two plywood products in-service, the 19-09-9 panel could experience an additional 55 % deflection, which provides a very different level of performance.

$$Stiffness\ Ratio = \frac{E.I_{19-30}}{E.I_{19-09-9}} = \frac{4.73 \times 10^9}{3.05 \times 10^9} = 1.55$$

COMMON APPLICATIONS

The following examples illustrate the differences in performance considering deflection, spanning capability, and required support spacing.

Domestic Flooring (Live load1.5kPa/1.8kN)

Consider both 19mm plywood panels for domestic floor application where floor joists are spaced at 600mm centres. CHH Ply Specification and Installation Guide notes that the maximum span of the 19mm (19-30-7) plywood flooring is 600mm. This span information is based on the Stress Grade, F11, and the ID Code/veneer layup 19-30-7.

For an applied concentrated load design deflection limit of span/200 (i.e. 600/200 = 3.0 mm) the 19-30-7 construction plywood deflects 2.74mm, which is less than the design requirement. However, when considering an alternate ID Code of 19-09-9, F11 and manufactured to the requirements of AS/NZS 2269.0, the 19-09-9 construction will deflect 4.25mm, 55% more than the CHH Ply construction option and 1.25mm, or 42%, above the design deflection limit which, as such, is not suitable for use for this application. The 19-09-9 F11 plywood panel should have joists closed up to 480mm centres to meet the design deflection limit.

Floor Joist Span Tables

The most common applications for plywood thicknesses over and above 15mm include roofing, membrane or flooring and decking applications. These applications are critical performance-based applications that typically require consideration of the effect of load sharing and distribution of lateral load forces in-service. Table 3. demonstrates the spanning capabilities of the two alternate 19mm F11 plywood products. Table 3 span tables have been developed based on EWPAA "Commercial and Industrial Flooring Design" guide where concentrated live load limits of Span/200 have been applied.

Table 3. Floor joist span tables for 19-30-7 and 19-09-9 plywood

Nominal Plywood thickness	ID Code	Stress Grade	House and Residential Bedrooms	Dining, Communal, Assembly, Classrooms	Institutional Assembly
			Maximum Joist centres (mm), plywood continuous over two spans, face grain across joists.		
19	19-30-7	F11	600	480	400
19	19-09-9	F11	480	400	300
Max UDL load (kPa)			2.0	4.0	5.0
Max Conc. Live Load (kN)			1.8	2.7	3.6

A review of the performance of the two alternate plywood layups, 19-09-9 with thinner outer veneers and 19-30-7, the standard CHH Ply layup, shows that there is a significant difference between the allowable floor joist spacing/plywood spans. Taking into account a span/200 deflection limit for concentrated loads, the 19-30-7 layup has a maximum span of 600mm compared to a maximum 480mm for the 19-09-7 when considering domestic live loads. This equates to requiring an extra joist for every 2.4m of building length.

For a town house of a length of 7.8m for the same flooring performance, 14 joists would be required to support the 19-30-7 F11 plywood, whilst 18 joists would be required for the alternative 19-09-9 F11 layup requiring an increase in support structure and labour for installation.

For thicker plywood products the veneer layup/construction will often have more effect on the stiffness and spanning capability than the stress grade.

PLYWOOD STRESS GRADE

The Stress Grade of Plywood relates to a specific suite of characteristic properties that are given in AS/NZS 2269.0. Plywood stress grades utilize the symbol 'F' and a suffix e.g. F8. The suffix generally relates to the basic working stress for a given grade and is applied in both directions - parallel (long) and perpendicular (minor) directions of a panel.

Where perpendicular to the grain stress grade is not given (e.g. F8/-) then substitution will require redesign. Typically, plywood products that are not graded in the perpendicular to grain direction are such that:

- the veneers in the perpendicular to the grain direction have not been visually or structurally graded
- the veneers in the perpendicular direction do not need to comply with AS/NZS 2269.0
- the performance in bracing/diaphragms may differ to those of product qualified in both directions

Where products are labeled with a single F grade, e.g. F8, it is assumed that the panel shares the same stress grade in both the parallel and perpendicular directions.

PLYWOOD SPECIFICATION

Where products are subject to Specific Engineering Design or specified from proprietary span tables, to ensure that performance requirements are met, the specification of plywood should include the following information as a minimum:

- A reference to AS/NZS 2269.0 Plywood
  - this ensures that a permanent Type A phenolic resin is used to bond the individual timber veneer; and the plywood will meet the New Zealand Building Code (NZBC)
- Face Grade
  - E.g. 'CD'
- 'F' Grade
  - E.g. F8/F8
- ID Code
  - E.g. 17-24-7

Note: All these details must be known and correct to meet the specification requirements

CONCLUSION:

As the New Zealand plywood supply landscape changes with an increased level of imported product available, it is even more important to make sure that both stress grade (e.g. F11/F8) and ID Code (e.g. 19-30-7) are considered in any substitution. Plywood products of the same nominal thickness (e.g. 12mm or 19mm plywood), manufactured to AS/NZS 2269.0 and sharing the same F-grade may not share the same performance levels.

The ID Code (veneer layup/construction) has a significant effect on the structural performance of plywood. This is demonstrated within this Technical Note where 19-30-7 and 19-09-9 plywood panels were compared and it was illustrated that the 19-30-7 layup, with thicker face veneers, was 55% stiffer than the 19-09-9 panel. As such, if used in a domestic flooring application, the floor joist spacing would need to be reduced from 600mm to 480mm.

The ID Code/veneer layup is, in many cases, more important than the stress grade and should always be considered in comparing product performance and substitution.

REFERENCES:

- NZS 3603:1993 "Timber Structures Standard"
- AS/NZS 2269:0:2012 "Plywood Structural"
- ECOPLY® SPECIFICATION & INSTALLATION GUIDE
- EWPAA "Commercial and Industrial Flooring Design"

LIMITATIONS:

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