



ENGINEERED WOOD PRODUCTS ASSOCIATION OF AUSTRALASIA



REPORT ON COMPLIANCE OF FORMWORK PLYWOOD

ON

LEINAD PTY LTD JOB SITE – SUTHERLAND, SYDNEY, NSW

APRIL 2008



INTRODUCTION AND BACKGROUND

The following report results from a site inspection and laboratory testing by the Engineered Wood Products Association of Australasia (EWPAA) to assess compliance of formwork plywood at the Leinad Pty Ltd job site Sutherland, Sydney, NSW.

The EWPAA became involved as plywood technical experts at the request of the Construction Forestry Mining and Energy Union (CFMEU) safety representatives.

By way of background, New South Wales safety regulations require all formwork to be constructed in accordance with AS 3610 – Formwork for Concrete. This Standard in turn (Clause 4.5.6.1 and Table 4.5.4) specifies that all formwork plywood must meet AS/NZS 2269 for structural performance and either AS/NZS 2269 or AS/NZS 2271 for bonding quality. In addition Clause 4.5.6.2 of AS 3610 includes the following mandatory requirement for unidentified materials

“Where it is not possible to identify materials of the type and grade which is specified in formwork documentation, these materials shall not be used in the construction of formwork”.

In summary to comply with AS 3610 and meet New South Wales safety regulations, the formwork plywood must have the following:

1. Be structurally rated in accordance with AS/NZS 2269
2. Bonding quality must comply with AS/NZS 2269 or AS/NZS 2271. These standards require either Type A or Type B bond quality as defined in AS 2754.1.
3. Be clearly labelled to identify the type and grade. In the case of formwork plywood, to meet labelling requirements of AS/NZS 2269 and/or AS/NZS 2271 labelling must include
 - The “F grade” for structural rating
 - The bond type
 - The panel identification code, to identify geometric properties to enable structural design
 - The Standard number
 - In addition, it is a requirement of Australian Plywood Standards that each and every sheet is labelled.

It should also be noted that Workcover NSW has an existing product safety alert for unbranded formply products (see Appendix B).

To assess the compliance and fitness for use of the formwork plywood, the following has been determined –

1. Branding has been inspected and assessed against AS/NZS 2269, AS/NZS 2271 and AS 3610
2. Bonding quality for Type A and B bond durability have been assessed at the EWPAA's NATA accredited laboratory using methods specified in AS/NZS 2098.2 – Bond Quality for Plywood.

In addition, the formwork plywood bond durability has also been tested against the lowest grade of adhesives permitted under Australian Standards, Type D. Type D bonded products are **not permitted** to be used in formwork plywood and are used exclusively in non-structural products. The purpose of testing for Type D bond durability was to determine if the plywood had **any** recognisable bond durability.

RESULTS OF INSPECTION AND TESTS

1. Physical Inspection of Formwork Plywood

A - General Assessment

The formwork showed signs of significant severe delamination. (Refer Plates One, Two and Three). This is of very serious concern as bond integrity is critical to the structural performance of the formwork plywood. In the writer's opinion, for this reason alone the formwork plywood should **not be used in any structural load carrying application**.



Plate One – Formwork Plywood sheet with severe delamination of the central glue line



Plate Two – Delaminating formwork plywood in deck

Note: The sheets with black overlay surrounding the brown imported delaminating sheet are the product certified Australian made equivalent. They remain intact and are structurally sound.



Plate Three - Pack of formwork plywood showing delamination on edges

B – Labelling

The formwork plywood sheets were inspected for branding (refer Plates 4 and 5). The sheets were unbranded and the stress-grade, panel construction code, bond type and Standard have not been identified. This is critical information necessary for safe design and use.

Clause 4.5.6.2 of AS 3610 Formwork in Concrete states that such unidentified materials cannot be used in formwork.

Again, on this basis the formwork plywood inspected **should not be used in structural formwork applications.**



Plate Four – Upper face of formwork plywood sheet – no brand



Plate Five – Bottom face of formwork plywood sheet – no brand

2. Bonding Quality

A test sample was taken from the job site by the writer. This sample was returned to the EWPAALaboratory and assessed for Type A, Type B and Type D bonding quality in accordance with AS/NZS 2098.2.

The test report is included in Appendix A.

None of the samples tested have passed bond quality and durability requirements of any of the Australian Standards, this includes the very low durability non-structural interior Type D bond.

Again, this is of major concern and these tests confirm the structural integrity of the formwork plywood sheets due to the very poor bond durability cannot be assured.

Bond durability results again clearly show that this formwork plywood should not be used in any structural application.

CONCLUSION

The plywood sheets inspected and tested have failed requirements of AS 3610 – Formwork in Concrete and the relevant Australian Plywood Product Standards due to

1. A lack of brands to identify the type, grade, structural F rating, durability or panel construction.
2. Bond quality – the formwork plywood sheets have failed to meet bond quality requirements of AS/NZS 2269 or AS/NZS 2271.

For these reasons the formwork plywood fails to meet material specifications and requirements of AS 3610 – Formwork in Concrete. Consequently, the plywood also does not meet NSW safety regulations.

RECOMMENDATION

The plywood tested and inspected should not be used in **any** structural load carrying application.

Simon Dorries,
General Manager
Engineered Wood Products Association of Australasia

April 2, 2008

APPENDIX A

RESULTS OF BOND QUALITY TESTING

EWPA Test Report Ref : 28/03/2008 3-128

Construction Forestry Mining and Energy Union

Results of Plywood Bond Quality Tests of Samples Received 28/03/2008 (Batch 3-128)

ID	Type	Bond		Norm Thick	Plys	Species	Finish	Comments	Thickness		Bond Quality				Avg	Result
		A Bond	B Bond						Manufactured	Measured	Bond Ratings	Bond Quality	Bond Quality	Bond Quality		
3-128-1-08	Structural	17	17	11	Formply	Finished	CHINESE POPLAR CORE, LEINAD P/L - SOUTHERLAND SITE	17.54	0	0	0	0	0	0	0.00	Fail
3-128-2-08	Structural	17	17	11	Formply	Finished	CHINESE POPLAR CORE, LEINAD P/L - SOUTHERLAND SITE	17.54	0	0	0	0	0	0	0.00	Fail
3-128-4-08	Interior	17	17	11	Formply	Finished	CHINESE POPLAR CORE, LEINAD P/L - SOUTHERLAND SITE	17.54	10	6	6	9	0	2	5.90	Fail

All thickness values are shown in mm.

Total Samples : 3 Samples Passed : 0 Batch Bond Quality Average : 3.10

The bond qualities and thicknesses of the above samples were determined in accordance with AS/NZS 2098.2-2006 (except section 8.1) and AS/NZS 2098.4-2006 respectively. The minimum and maximum thickness have not been reported.

Regards



Simon Dorries
Manager

APPENDIX B

WORKCOVER NEW SOUTH WALES

PRODUCT SAFETY ALERT



INDUSTRY PLANT CONSULTATIVE COMMITTEE SAFETY ALERT

PLYWOOD USED IN FORMWORK

ISSUE

The adequacy of plywood used in formwork systems. WorkCover NSW has become aware of plywood being imported into Australia that has no markings indicating its structural strength. If this plywood is used in formwork, it is likely to fail, with potentially serious consequences.

BACKGROUND

Plywood used as formwork in decking, soffits and walls/columns, commonly known as "formply", is exposed to substantial forces. These are largely dead loads from the weight of reinforcing steel and concrete, and can be increased considerably by live loads such as those generated by persons working on the decking, plant used during the concrete pour, and wind loads. The plywood must be strong enough to withstand these forces.

The *Occupational Health and Safety Regulation 2001* requires employers to ensure that formwork comply with AS 3610 *Formwork for concrete*. This standard specifies that plywood complies with AS/NZS 2269 *Structural plywood* for structural properties and, depending on its type, either AS/NZS 2269 or AS/NZS 2271 *Plywood and blockboard for exterior use* for its bond quality. It also states that components, including plywood, used in the formwork assembly must be of the specified type and material grade, and where they do not meet the criteria, they be rejected. It further states that where it is not possible to identify materials as being of the type and grade which is specified on the formwork documentation, they are not used in the construction of the formwork.

AS/NZS 2269 specifies testing requirements that are used to determine the strength, or "stress grade", of the plywood, which is designated an "F-value", where a higher the F-value indicates stronger plywood. Typically, plywood used as formply has a stress-grade of F11 to F27, with F17 being the most common grade. The standard requires that each sheet of plywood be marked to indicate that it complies with the requirements of the standard and to show its stress grade.

Some plywood recently imported into Australia has been found with no markings on it that identify its stress grade or indicates its compliance with the relevant Australian Standard. Independent testing on samples of this plywood shows that it possess properties equivalent to plywood with an F8 grade, and that the glue bond was not durable as it failed to meet the requirements of AS/NZS 2269 or AS/NZS 2271. This plywood should not be used as formply; if it is, it could fail with severe consequences.

WHAT SHOULD BE DONE?

Employers:

Employers must ensure that formwork complies with AS 3610. For plywood, this means that employers must ensure it complies with AS/NZS 2269 and the appropriate part of either AS/NZS 2269 or AS/NZS 2271 as applicable, and be of the appropriate stress grade for the formwork assembly. For new batches of plywood sheets, this should be readily discernible as each sheet must be marked to indicate compliance with the relevant standard and its stress grading.

Plywood Suppliers:

Persons supplying plywood claiming compliance with the relevant part of AS/NZS 2269 and/or AS/NZS 2271 must ensure that such claims can be authenticated. Each plywood sheet must be appropriately marked with the information required by the standard, including its stress grade. Consideration should be given to using a method of marking that is durable enough to enable the plywood be identified throughout its anticipated usage, including reuse.

Note: Plywood produced under a JAS-ANZ accredited product certification scheme provides reliable independent verification of product compliance.

Formwork Suppliers:

Formwork suppliers must ensure that the plywood used in the formwork assembly complies with the relevant part of AS/NZS 2269 or AS/NZS 2271, and be of the appropriate grade. Each new sheet of plywood must be marked with the information required by the standards, including compliance with the standard and its stress grade. Where necessary, consideration should be given to applying additional marking that is durable enough to enable the plywood be identified in subsequent usage. If plywood cannot be identified as meeting the necessary specifications for the formwork assembly, it must not be used.

Failure to ensure the adequacy of plywood used as formply could result in a serious accident.