

HOUTIMPORT



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Fax +32 54 50 04 13
RPR Oudenaarde
B.T.W. BE 0400.248.526
BvB 645-1977686-85
KBC 737-0131036-32

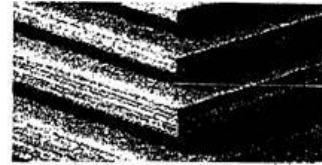
n.v. Simon & Zonen

Sas 58

9506 IDEGEM

Multiplex 100% Hardhout
is dus even goed
zeker even goed.

CONTREPLAQUE - PLYWOOD - MULTIPLEX



Composition

Qualité/Quality/Kwaliteit	+B/BB	
Cœur/Core/Kern :	Eucalyptus - bois dur/hardwood/hardhout	
Colle/Glue/Lijm :	WBP/E1	(EN314-2)

Utilisation/Use/Gebruik

Usage externe humide/Humid outdoor use/Vochtig Bultenhuis gebruik	(EN636-3)
Usage interne humide/Humid indoor use/Vochtig Binnenhuis gebruik	(EN636-2)

Caractéristiques/Specifications/Kenmerken

Ébullition/Boilproof/Kooktest:	+24h/u	
Résistance à l'eau/Waterresistance:	Colle/Glue/Lijm WBP	
Densité/Density/Densiteit:	580kg/m ³	(EN323)
Humidité/Humidity/Vochtigheid:	<12% (EN-322)	(EN322)
Dimension Tolérance/Tolerance/Tolerantie:	±0,5mm	
Déformation/Warp/Werken	<1%	
Élasticité longitudinalement/longitudinally:	35-45N/mm ²	(EN310)
Élasticité longitudinalement/longitudinally:	32-35N/mm ²	(EN310)

Dimensions/Dimensions/Afmetingen (stock)

Standard 2500x1220mm:	3,6/5/8/10/12/15/18/21/25/30/35/40mm	(EN324-1)
XLarge 3050x1530mm:	5/8/10/12/15/18/21/25/30/35/40mm	(EN324-1)

Écologie/Ecology/Ecologie

EUTR-conforme	100% Sylviculture durable/Durable forestry
CARB-conforme	Émission contrôlée/Controlled emission
FSC/PEFC	Sur demande/On demand/Op aanvraag

Certificats/Certificaten

EUTR, CARB, CE+, PSA

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alpinele meranti multiplex

CONTREPLAQUÉ – PLYWOOD - MULTIPLEX



Composition

Contreplaqué/Veneer/Fineer :	Meranti
Qualité/Quality/Kwaliteit	A/A & BB/CC
Cœur/Core/Kern :	100% bois dur Indonésien/Indonesian hardwood
Colle/Glue/Lijm :	WBP (EN-314-2, class 3) (EN314-2)

Utilisation/Use/Gebruik

Usage externe humide/Humid outdoor use/Vochtig Buitenshuis gebruik	(EN636-3)
Usage interne humide/Humid indoor use/Vochtig Binnenshuis gebruik	(EN636-2)
Classe/Class/Klasse:	II+III (EN635-4)

Caractéristiques/Specifications/Kenmerken

Haute Résistance à l'eau/High Waterresistance:	Colle/Glue/Lijm WBP
Emission basse/Low emission :	E1 = $\leq 8.0\text{mg}/100\text{g}$
Densité/Density/Densiteit:	600-650kg/m ³ (EN323)
Humidité/Humidity/Vochtigheid:	8-12% (EN-322) (EN322)
Equerrage/Squareness/Haaksheid	1mm/m
Dimension Tolérance/Tolerance/Tolerantie:	$\pm 3.5\text{mm}$
Déformation/Warp/Werken	<1%
Élasticité longitudinalement/longitudinally:	35-45N/mm ² (EN310)
Élasticité longitudinalement/longitudinally:	32-35N/mm ² (EN310)

Dimensions/Dimensions/Afmetingen (stock)

Standard 2500x1220mm:	3.6/5/5.5/8/9/10/12/15/18/22/25mm (EN324-1)
	18mm (EN324-1)

Écologie/Ecology/Ecologie


EUTR-conforme	100% Sylviculture durable/Durable forestry
PFLEGT-certificate	EU certificate de silviculture légale/legal forestry
FSC/PEFC	Sur demande/On demand/Op aanvraag

Certificats/Certificaten

EUTR, PFLEGT, CE, (FSC), (PEFC)

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Elliottis Rue 11612

Certifications stamp

Companies that have successfully passed in the certification process are allowed to print at the plywood face, or at the edge, the Certification Stamp considering the standards defined by the CNQM

The Certification Stamp has the basic information, necessary to identify the product, including: producer, grade, dimensions, recommended use and others aspects.

Figure 02, presents the Certification Stamp used by the National Program for Wood Quality (PNQM).

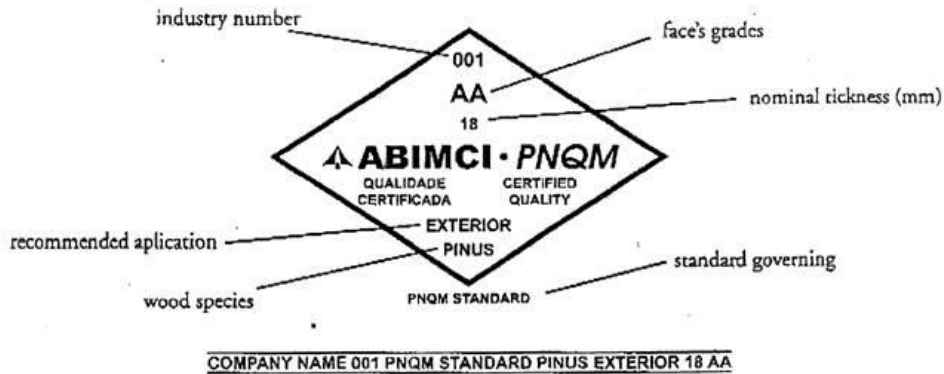


Figure 02 – Certification stamp.

Quality standards

Basics types of panels

For pine plywood the Program considers two basic panels' types, they are:

Interior – IR

Plywood bonded with interior glue type. The plywood produced with this glue is recommended for uses in protected places, without direct contact with water or even relative humidity. In most cases the glue is based in urea-formaldehyde resins.

Exterior – EX

Plywood bonded with exterior glue type. The plywood produced with this kind of glue can be used outside or in places with high relative humidity, or in direct contact with water. The phenolic based resins are largely used, but there are another resin types that can be applied.

Dimensions and constructive features

Table 01 presents the dimensions and the main constructive features adopted by PNQM for plywood panels, including: thickness, minimum number of plies and tolerances.

Table 01 – Dimensions and constructive features for pine plywood.

Panel thickness (mm)	Minimum number of plies	Tolerances		
		Thickness (%)	Length (mm)	Width (mm)
09				
12	05			
15				
18	07	+/-5	+0.0/-2.0	+0.0/-2.0
21	09			
22	09			
25	11			

The standard panel has 2440 mm (8 ft) in length and 1220 mm (4 ft) in width. Others dimensions are considered specials.

Panel grades

2

The pine plywood panels are graded based in their face and back face quality. The grading criteria take into consideration the type, quantity and dimensions of defects. Grading is held on a visual inspection.

The grades and requirements established by PNQM for pine plywood are presented in table 02. Figure 03 presents the pictures of the examples of pine veneers (plywood faces) from de different grades defined by PNQM.

Table 02 – Criteria for grading pine plywood.

TYPE OF DEFECT	FACE VANNER GRADE				
	A	B	C+	C	D
SOUND KNOTS	Not accepted.	Less than 10 mm in diameter and maximum 10 units/face are allowed.		No limitation.	
OPEN KNOT/OPENINGS	Not accepted.	Open knots and openings caused by machinery instruments not bigger than 6 x 12,5 mm and repaired with filler.	No limits for open knots and holes caused by machinery instruments. However it size shall not exceed 65 mm in diameter with average under 50 mm and repaired with filler	No limitation.	
CORE GAP		Gaps under 20 mm are allowed	Gaps under 50 mm are allowed		No limitation.
OPEN JOINTS	Not accepted.		Open Joints not large than 2 mm in width and repaired with filler are allowed	Open Joints not large than 5 mm in width and repaired with filler are allowed	No limitation.
CRACKS	Not accepted.	Cracks less than 5 mm in width and 300 mm in length, and repaired with filler, are allowed.	Cracks less than 10 mm in width and 600 mm in length, and repaired with filler, are allowed.	Cracks less than 15 mm in width and 700 mm in length, and repaired with filler, are allowed.	No limitation.
NUMBER OF FACE JOINTS	None.		Only one	Maximum two	Maximum four
LAP	Not allowed	One per m ² , not exceeding 100 mm in length	Maximum two per m ² , not exceeding 400 mm in length	Maximum two per m ² , not exceeding 600 mm in length	No limitation
BLUE STAIN	Not allowed.		Maximum 10% of faces area	Maximum 20% of faces area	No limitation.

Table 02 (cont.) – Criteria for grading pine plywood.

TYPE OF DEFECT	FACE VANNER GRADE				
	A	B	C+	C	D
WOOD REPAIR/PATCHING	Not exceeding 25 mm in width and 200 mm in length, combined in color and grain, glued with same resin of the panel production.	Not exceeding 100 mm in width and 600 mm in length, combined in color and grain, glued with same resin of the panel production.	Not exceeding 100 mm in width and 700 mm in length, combined in color and grain, glued with same resin of the panel production.	No limitation. However glued with de same resin of the panel production.	
SUM OF FACE DEFECTS (OPENED JOINTS + CRACKS + WOOD REPAIR / PATCHING + OPEN KNOT)	The number of repairs shall not exceed 6 of the total panel surface.	The number of repairs shall not exceed 8 of the total panel surface.	The number of repairs shall not exceed 30 of the total panel surface.	No limitations.	

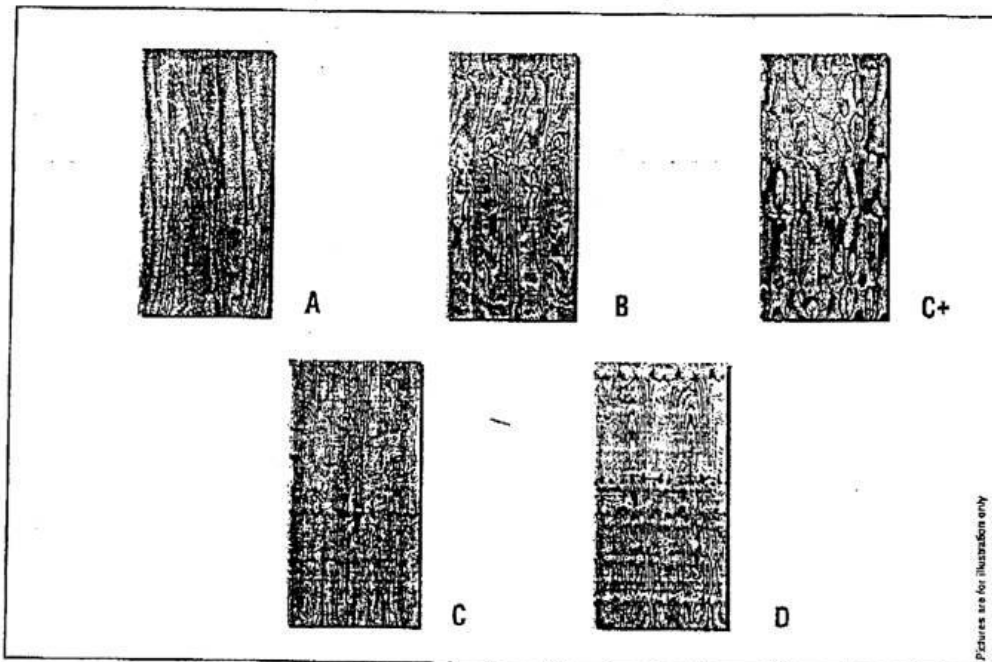


Figure 03 – Plywood grades.

Panel proprieties

Source of information

The information in the physical and mechanical proprieties presented in this document is based on material collected at the mills involved in the Program. Material collection started at the first months of 2000.

The tests have been carried out in the Laboratory of Engineering and Forestry Technology Department of the Federal University of Paraná – UFPR, located in Curitiba, Brazil. This laboratory has all the equipment needed to test wood panels in accordance with national and international standards. It also has highly qualified staff.

The pine plywood proprieties, presented in this document are based on more than 20.000 tests obtained from material collected in 18 producers. All tested panels are exterior type, graded as C+/C and unsanded.

Normative references

National and international standards were used to determine the physical and mechanical proprieties of pine plywood.

The procedures and methodologies adopted by the UFPR laboratory to determine the proprieties of the pine plywood panels are in agreement with the following standards:

- ASTM-D-3500-90. Standard Methods of Testing Structural Panels in Tension.
- ASTM-D-3043-95. Standard Methods of Testing Structural Panels in Flexure.
- ABNT NBR-9484 – Plywood – Determination of Moisture Content.
- ABNT NBR-9485 – Plywood – Determination of Density.
- ABNT NBR-9488 – Sampling for Plywood Tests.
- ABNT NBR-9489 – Conditioning of Plywood Samples for Testing.
- ABNT NBR-9490 – Wood Plies and Plywood.
- ABNT NBR-9531 – Plywood Panel.
- ABNT NBR-9532 – Plywood Panel.
- ABNT NBR-9534 – Plywood – Determination of Glue Line Resistance under Shear Strength.

Results

The physical and mechanical proprieties considered as a basic standard by PNQM for the Brazilian pine plywood are presented on tables 03 to 07.

For each propriety is presented the average and the maximum and minimum values. The maximum and minimum values were calculated considering one standard deviation in relation to the average.

Table 03 – Density of Brazilian pine plywood⁽¹⁾.

THICKNESS (mm)	NUMBER OF PLYES		*kg/m ³
09	05	MAXIMUM	614
		AVERAGE	565
		MINIMUM	516
12	05	MAXIMUM	573
		AVERAGE	532
		MINIMUM	491
15	05	MAXIMUM	547
		AVERAGE	512
		MINIMUM	477
15	07	MAXIMUM	591
		AVERAGE	554
		MINIMUM	517
18	07	MAXIMUM	564
		AVERAGE	528
		MINIMUM	492
18	09	MAXIMUM	596
		AVERAGE	559
		MINIMUM	522
20	07	MAXIMUM	554
		AVERAGE	523
		MINIMUM	492
20	09	MAXIMUM	585
		AVERAGE	538
		MINIMUM	491

(1) C+/C panels, exterior type, unsanded, 10 – 11% moisture content.

(*) The maximum and minimum values represent one standard deviation in relation to the average.

Table 06 – Glue line test for Brazilian pine plywood⁽¹⁾.

THICKNESS (mm)	NUMBER OF PLIES	VALUES				
		DRY TEST*		HUMITY TEST*		
		TENSION (kgf/cm ²)	WF ⁽²⁾ %	TENSION (kgf/cm ²)	WF ⁽²⁾ %	
09	05	MAXIMUM	38	96	22	68
		AVERAGE	29	62	17	36
		MINIMUM	21	28	11	5
12	05	MAXIMUM	37	97	21	77
		AVERAGE	28	65	15	43
		MINIMUM	18	33	10	9
15	05	MAXIMUM	31	89	19	79
		AVERAGE	22	54	13	39
		MINIMUM	13	19	8	0
15	07	MAXIMUM	39	98	20	87
		AVERAGE	29	68	15	54
		MINIMUM	19	37	9	20
18	07	MAXIMUM	36	95	19	83
		AVERAGE	28	62	14	48
		MINIMUM	19	30	8	14
18	09	MAXIMUM	37	74	20	78
		AVERAGE	27	43	14	46
		MINIMUM	17	12	7	15
20	07	MAXIMUM	34	100	18	96
		AVERAGE	25	73	13	64
		MINIMUM	16	43	8	31
20	09	MAXIMUM	42	78	22	55
		AVERAGE	30	45	15	29
		MINIMUM	19	12	9	4

(1) Quality C+/C, exterior, unsanded, 10 – 11% moisture content.

(2) WF = wood failure.

(*) The maximum and minimum values represent one standard deviation in relation to the average.

Table 07 – Compression resistance for Brazilian pine plywood⁽¹⁾.

THICKNESS (mm)	NUMBER OF PLIES	*kgf/cm ²		
		PARALELL	PERPENDICULAR	
09	05	MAXIMUM	333	232
		AVERAGE	250	169
		MINIMUM	168	106
12	05	MAXIMUM	266	243
		AVERAGE	205	180
		MINIMUM	143	118
15	05	MAXIMUM	255	207
		AVERAGE	193	168
		MINIMUM	130	129
15	07	MAXIMUM	277	256
		AVERAGE	207	194
		MINIMUM	137	132
18	07	MAXIMUM	248	250
		AVERAGE	192	195
		MINIMUM	136	140
18	09	MAXIMUM	268	217
		AVERAGE	216	174
		MINIMUM	163	130
20	07	MAXIMUM	240	250
		AVERAGE	181	194
		MINIMUM	123	137
20	09	MAXIMUM	249	266
		AVERAGE	194	208
		MINIMUM	140	151

(1) C+/C panel, exterior type, unsanded, 10 – 11% moisture content.

(*) The maximum and minimum values represent one standard deviation in relation to the average.

Information for structural applications

Parameters and methodology

The bending deflection of pine plywood panels took into consideration the test results, and were based in structural calculations procedures, taking in considering international standards. Details of methodology applied can be found in the text book "Materials Resistance" (Ferdinand P. Beer and E. Russel Johnston Jr, 1999).

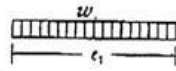
(7)

The deflections were calculated considering the application of the plywood panels for concrete forms, supporting pressures equal to concrete slabs with 8, 10, 12 and 15 cm thick. Concrete density was considered 2,700 kg/m³. As a result of these assumptions pressures equal to 220 kgf/m², 270 kgf/m², 330 kgf/m² and 410 kgf/m² were obtained.

Equations used in the deflections calculations are presented below:

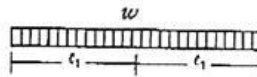
For one span (equation 1)

$$f = \frac{w \times \ell^4}{76,8 \times E \times I}$$



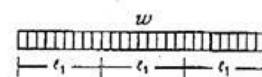
For two spans (equation 2)

$$f = \frac{w \times \ell^4}{185 \times E \times I}$$



For three or more spans (equation 3)

$$f = \frac{w \times \ell^4}{145,25 \times E \times I}$$



where:

f = deflection (m)

w = pressure (N/m²)

ℓ = span length (m)

E = modulus of elasticity (N/m²)

I = moment of inertia (m⁴/m)

Deflection tables

The deflections for the Brazilian Pine plywood obtained from the calculations are presented on tables 08 to 11. The gray cells represent deflection values under $\ell/360$, where ℓ is the span length. This deflection limit is considered as acceptable based in international standards.

Table 08 – Brazilian pine plywood⁽¹⁾ deflection (pressure 220 kgf/m²).

DEFLECTION IN MILLIMETERS FOR ONE SPAN									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.48	0.25	0.13	0.13	0.08	0.07	0.06	0.06
16	406.40	1.51	0.79	0.40	0.40	0.25	0.23	0.19	0.20
20	508.00	3.68	1.92	0.98	0.98	0.62	0.55	0.47	0.48
24	609.60	7.62	3.98	2.03	2.04	1.28	1.15	0.98	1.00
32	812.80	24.08	12.59	6.41	6.43	4.06	3.63	3.09	3.15
DEFLECTION IN MILLIMETERS FOR TWO SPANS									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.20	0.10	0.05	0.05	0.03	0.03	0.03	0.03
16	406.40	0.62	0.33	0.17	0.17	0.11	0.09	0.08	0.08
20	508.00	1.53	0.80	0.41	0.41	0.26	0.23	0.20	0.20
24	609.60	3.16	1.65	0.84	0.84	0.53	0.48	0.41	0.41
32	812.80	10.00	5.23	2.66	2.67	1.69	1.51	1.28	1.31
40	1016.00	24.41	12.76	6.50	6.52	4.11	3.68	3.13	3.19
DEFLECTION IN MILLIMETERS FOR THREE SPANS									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.25	0.13	0.07	0.07	0.04	0.04	0.03	0.03
16	406.40	0.80	0.42	0.21	0.21	0.13	0.12	0.10	0.10
20	508.00	1.94	1.02	0.52	0.52	0.33	0.29	0.25	0.25
24	609.60	4.03	2.11	1.07	1.08	0.68	0.61	0.52	0.53
32	812.80	12.73	6.66	3.39	3.40	2.15	1.92	1.64	1.67
40	1016.00	31.09	16.25	8.28	8.30	5.24	4.68	3.99	4.07

(1) C+C panel, exterior type, unsanded, parallel to grain.

(*) The gray cells represents bending deflection values under $\ell/360$.

(P) Number of plies.

Table 09 – Brazilian pine plywood⁽¹⁾ deflection (pressure 270 kgf/m²).

DEFLECTION IN MILLIMETERS FOR ONE SPAN									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.58	0.31	0.16	0.16	0.10	0.09	0.08	0.08
16	406.40	1.85	0.97	0.49	0.49	0.31	0.28	0.24	0.24
20	508.00	4.51	2.36	1.20	1.20	0.76	0.68	0.58	0.59
24	609.60	9.35	4.89	2.49	2.50	1.58	1.41	1.20	1.22
32	812.80	29.56	15.45	7.87	7.89	4.98	4.45	3.80	3.87

DEFLECTION IN MILLIMETERS FOR TWO SPANS									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.24	0.13	0.06	0.06	0.04	0.04	0.03	0.03
16	406.40	0.77	0.40	0.20	0.20	0.13	0.12	0.10	0.10
20	508.00	1.87	0.98	0.50	0.50	0.32	0.28	0.24	0.25
24	609.60	3.88	2.03	1.03	1.04	0.65	0.58	0.50	0.51
32	812.80	12.27	6.41	3.27	3.28	2.07	1.85	1.58	1.61
40	1016.00	29.96	15.66	7.98	8.00	5.05	4.51	3.85	3.92

DEFLECTION IN MILLIMETERS FOR THREE SPANS									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.31	0.16	0.08	0.08	0.05	0.05	0.04	0.04
16	406.40	0.98	0.51	0.26	0.26	0.16	0.15	0.13	0.13
20	508.00	2.38	1.25	0.64	0.64	0.40	0.36	0.31	0.31
24	609.60	4.95	2.58	1.32	1.32	0.83	0.74	0.63	0.65
32	812.80	15.63	8.17	4.16	4.17	2.63	2.35	2.01	2.05
40	1016.00	38.16	19.94	10.16	10.19	6.43	5.75	4.90	4.99

(1) C+C panel, exterior type, unsanded, parallel to grain.
 (*) The gray cells represents bending deflection values under $t/360$.
 (P) Number of plies.

Table 10 – Brazilian pine plywood⁽¹⁾ deflection (pressure 330 kgf/m²).

DEFLECTION IN MILLIMETERS FOR ONE SPAN									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.71	0.37	0.19	0.19	0.12	0.11	0.09	0.09
16	406.40	2.26	1.18	0.60	0.60	0.38	0.34	0.29	0.30
20	508.00	5.51	2.88	1.47	1.47	0.93	0.83	0.71	0.72
24	609.60	11.43	5.97	3.04	3.05	1.93	1.72	1.47	1.50
32	812.80	36.13	18.88	9.62	9.65	6.09	5.44	4.64	4.73

DEFLECTION IN MILLIMETERS FOR TWO SPANS									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.30	0.16	0.08	0.08	0.05	0.04	0.04	0.04
16	406.40	0.94	0.49	0.25	0.25	0.16	0.14	0.12	0.12
20	508.00	2.29	1.20	0.61	0.61	0.39	0.34	0.29	0.30
24	609.60	4.75	2.48	1.26	1.27	0.80	0.71	0.61	0.62
32	812.80	15.00	7.84	3.99	4.01	2.53	2.26	1.93	1.96
40	1016.00	36.62	19.14	9.75	9.78	6.17	5.51	4.70	4.79

DEFLECTION IN MILLIMETERS FOR THREE SPANS									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.38	0.20	0.10	0.10	0.06	0.06	0.05	0.05
16	406.40	1.19	0.62	0.32	0.32	0.20	0.18	0.15	0.16
20	508.00	2.91	1.52	0.78	0.78	0.49	0.44	0.37	0.38
24	609.60	6.04	3.16	1.61	1.61	1.02	0.91	0.78	0.79
32	812.80	19.10	9.98	5.09	5.10	3.22	2.88	2.45	2.50

(1) C+C panel, exterior type, unsanded, parallel to grain.
 (*) The gray cells represents bending deflection values under $t/360$.
 (P) Number of plies.

Table 11 – Brazilian pine plywood⁽¹⁾ deflection (pressure 410 kgf/m²).

DEFLECTION IN MILLIMETERS FOR ONE SPAN									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.89	0.46	0.24	0.24	0.15	0.13	0.11	0.12
16	406.40	2.81	1.47	0.75	0.75	0.47	0.42	0.36	0.37
20	508.00	6.85	3.58	1.82	1.83	1.15	1.03	0.88	0.90
24	609.60	14.20	7.42	3.78	3.79	2.39	2.14	1.82	1.86
DEFLECTION IN MILLIMETERS FOR TWO SPANS									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.37	0.19	0.10	0.10	0.06	0.06	0.05	0.05
16	406.40	1.16	0.61	0.31	0.31	0.20	0.18	0.15	0.15
20	508.00	2.84	1.49	0.76	0.76	0.48	0.43	0.37	0.37
24	609.60	5.90	3.08	1.57	1.57	0.99	0.89	0.76	0.77
32	812.80	18.63	9.74	4.96	4.98	3.14	2.81	2.39	2.44
DEFLECTION IN MILLIMETERS FOR THREE SPANS									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.80	0.47	0.25	0.12	0.13	0.08	0.07	0.06	0.06
16	406.40	1.48	0.78	0.40	0.40	0.25	0.22	0.19	0.19
20	508.00	3.82	1.89	0.96	0.97	0.61	0.55	0.47	0.47
24	609.60	7.51	3.93	2.00	2.01	1.27	1.13	0.96	0.98
32	812.80	23.73	12.41	6.32	6.34	4.00	3.57	3.05	3.11

(1) C+/C panel, exterior type, unsanded, parallel to grain.

(*) The gray cells represents bending deflection values under $l/360$.

(P) Number of piles.

To facilitate the application of the information provided by this Technical Catalogue, maximum acceptable pressure (load/m²) considering the deflection limitation of $l/360$ is presented in table 12. The data is also presented in graphic form in figure 04.

Table 12 – Maximum pressure for Brazilian pine plywood⁽¹⁾ to attend $l/360$.

PRESSURE LIMIT (kgf/m ²) FOR $l/360$ BENDING DEFLECTION									
Span		Panel Thickness (mm)							
(in)	(mm)	9	12	15 (5 P)	15 (7 P)	18 (7 P)	18 (9 P)	20 (7 P)	20 (9 P)
12	304.8	739.9	1415.5	2778.3	3425.4	4389.1	4845.4	5762.1	5653.8
16	406.4	312.1	597.2	1172.1	1445.1	1851.7	2044.1	2430.9	2385.2
20	508.0	159.8	305.8	600.1	739.9	948.0	1046.6	1244.6	1221.2
24	609.6	92.5	176.9	347.3	428.2	548.6	605.7	720.3	706.7
32	812.8	39.0	74.6	146.5	180.6	231.5	255.5	303.9	298.1
40	1016.0	20.0	38.2	75.0	92.5	118.5	130.8	155.6	152.7
48	1219.2	11.6	22.1	43.4	53.5	68.6	75.7	90.0	88.3

(1) C+/C Panel, exterior type, unsanded, parallel to grain.

(P) Number of piles.

Table 02 (cont.) – Criteria for grading pine plywood.

(10)

TYPE OF DEFECT	FACE VENNER GRADE				
	A	B	C+	C	D
WOOD REPAIR/PATCHING	Not exceeding 25 mm in width and 200 mm in length, combined in color and grain, glued with same resin of the panel production.	Not exceeding 100 mm in width and 600 mm in length, combined in color and grain, glued with same resin of the panel production.	Not exceeding 100 mm in width and 700 mm in length, combined in color and grain, glued with same resin of the panel production.	No limitation. However glued with de same resin of the panel production.	
SUM OF FACE DEFECTS (OPENED JOINTS + CRACKS + WOOD REPAIR / PATCHING + OPEN KNOT)	The number of repairs shall not exceed 6 of the total panel surface.	The number of repairs shall not exceed 8 of the total panel surface.	The number of repairs shall not exceed 30 of the total panel surface.	No limitations.	

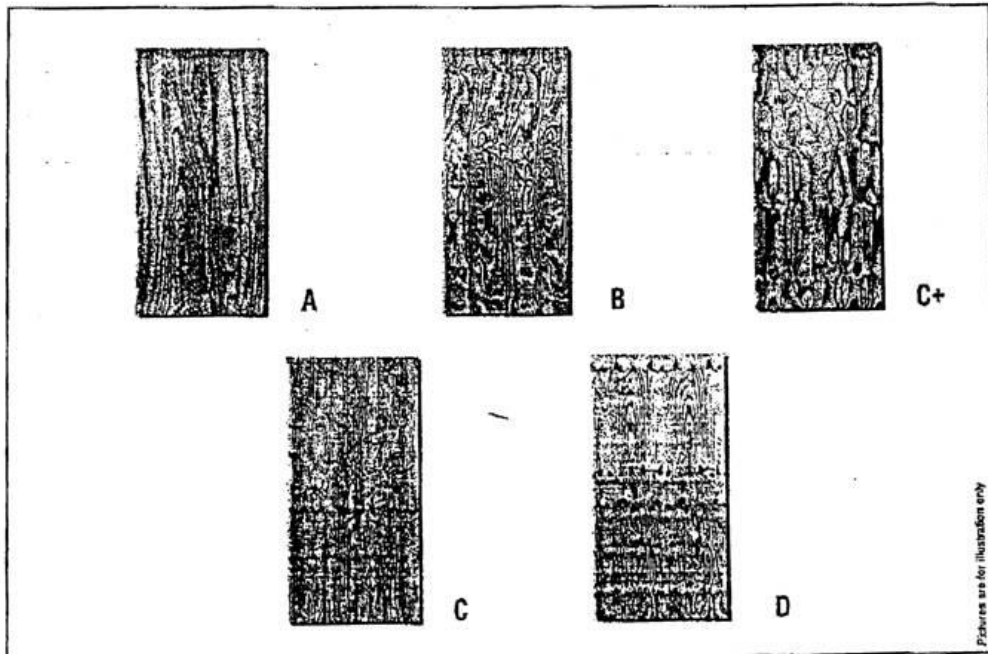


Figure 03 – Plywood grades.

Panel proprieties

Source of information

The information in the physical and mechanical proprieties presented in this document is based on material collected at the mills involved in the Program. Material collection started at the first months of 2000.

The tests have been carried out in the Laboratory of Engineering and Forestry Technology Department of the Federal University of Paraná – UFPR, located in Curitiba, Brazil. This laboratory has all the equipment needed to test wood panels in accordance with national and international standards. It also has highly qualified staff.

The pine plywood properties, presented in this document are based on more than 20.000 tests obtained from material collected in 18 producers. All tested panels are exterior type, graded as C+/C and unsanded.

Normative references

National and international standards were used to determine the physical and mechanical properties of pine plywood.

The procedures and methodologies adopted by the UFPR laboratory to determine the properties of the pine plywood panels are in agreement with the following standards:

- ASTM-D-3500-90. Standard Methods of Testing Structural Panels in Tension.
- ASTM-D-3043-95. Standard Methods of Testing Structural Panels in Flexure.
- ABNT NBR-9484 – Plywood – Determination of Moisture Content.
- ABNT NBR-9485 – Plywood – Determination of Density.
- ABNT NBR-9488 – Sampling for Plywood Tests.
- ABNT NBR-9489 – Conditioning of Plywood Samples for Testing.
- ABNT NBR-9490 – Wood Plies and Plywood.
- ABNT NBR-9531 – Plywood Panel.
- ABNT NBR-9532 – Plywood Panel.
- ABNT NBR-9534 – Plywood – Determination of Glue Line Resistance under Shear Strength.

Results

The physical and mechanical properties considered as a basic standard by PNQM for the Brazilian pine plywood are presented on tables 03 to 07.

For each property is presented the average and the maximum and minimum values. The maximum and minimum values were calculated considering one standard deviation in relation to the average.

Table 03 – Density of Brazilian pine plywood⁽¹⁾.

THICKNESS (mm)	NUMBER OF PLYS	*kg/m ³	
		MAXIMUM	AVERAGE
09	05	614	565
		516	
		573	
12	05	532	491
		491	
		547	
15	05	512	477
		477	
		591	
15	07	554	517
		517	
		564	
18	07	528	492
		492	
		596	
18	09	559	522
		522	
		554	
20	07	523	492
		492	
		585	
20	09	538	491
		491	

(1) C+/C panels, exterior type, unsanded, 10 – 11% moisture content.

(*) The maximum and minimum values represent one standard deviation in relation to the average.