Dimensional Stabilization

Summary Report

Forestry Department
Alberta Research Council[1]

1990

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DISCLAIMER

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Forestry Canada
Regional Development
5320 - 122nd Street
Edmonton, Alberta
T6H 3S5
Telephone: (403) 435-7210

or

Forestry, Lands and Wildlife
Forest Industry Development Division
108th Street Building
#930, 9942 - 108th Street
Edmonton, Alberta
T5K 2J5
Telephone: (403) 422-7011

Summary

The purpose of this project is to demonstrate methods of improving dimensional stability of oriented strandboard through scale-up work at the Alberta Research Council Panel Pilot Plant. This year three industry candidates were chosen:

* Forintek Canada Corporation to scale up post press heat treatment
* Reichhold Limited to scale up OSB manufacture with a new resin, and
* K.C. Shen Technology International Limited to scale up OSB manufacture with a lignin based resin.

The specific accomplishments on this project are:

* Scale up of three dimensional stability technologies including evaluation of mechanical properties,
* measurement of thickness swell and linear expansion,
* evaluation of the treatment effects on other properties,
* ARC Panel Pilot Plant was used for demonstrations, and
* a workshop was held to review results and make recommendations for future work.

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1. OBJECTIVES

The objectives of this project as set out in Schedule "A" of the contract are as follows:

"The work in this project shall include the demonstration of three panelboard technologies that clearly show definite improvement in the dimensional stability of OSB. Specifically, the work shall include:

a. Measurement of dimensional stability improvement by standard thickness swelling and linear expansion tests.

b. Dimensional stability improvement shall be made without adversely affecting the structural performance of OSB.

c. The demonstration projects shall be done in cooperation with industry using ARC panel pilot plant facilities.

d. ARC shall assist industry in optimizing and scaling up their technology in the pilot plant and shall evaluate the properties of the OSB panels based on the CAN/CSA-0437.0-M85 (Group 1 plus LE (OD-SAT) and stiffness standard.

e. ARC in cooperation with three industry candidates shall organize a workshop making recommendations for successful technologies in mill trials.

2. HISTORY OF THE PROJECT

In 1986/87 the Canada-Alberta Forest Resource Development Agreement funded an ARC Forest Products project to conduct a literature review on dimensional stabilization of wood products. Based on this work, a research program was initiated at ARC to investigate methods of stabilizing oriented strandboard/waferboard.

Initial work looked at the effect of resin content. This is an expensive approach and there are also limits to the amount of powdered phenol formaldehyde (the most common OSB resin used in Alberta) that will stay on the strands. Work last year developed a relationship between resin content and thickness swell for liquid phenolic and isocyanate resins. Basic relationships were also developed to relate time and temperature to thickness swell. This is applicable to prolonging press cycles, evaluating press temperatures, or post press heat treatments.

1989/90 Project Background

The objective of the project was to demonstrate three technologies that show improvement in the dimensional stability of oriented strandboard. The three candidates were:

Forintek
Reichhold Limited
K.C. Shen Technology International Limited

The details of all three projects will be presented in the proceedings of a workshop held at ARC on March 29, 1990. This report has a summary of test results, but no process details. All work was done at the ARC Forest Products Laboratories.

Forintek Canada Corporation demonstrated post press heat treatment of panels. A summary of results is given in Table 1.; individual data sheets are presented in Appendix A. Reichhold Limited demonstrated a new resin - BD905. The preliminary results were not what had been predicted, so Reichhold recommended more work on the formulation before full scale lab work was done. Initial results are given in Appendix B. The final candidate was K.C.Shen Technology International Limited. He demonstrated the use of a lignin based adhesive. A summary of test results is given in Table 2: detailed data sheets are given in Appendix C.

3. CONCLUSIONS AND RECOMMENDATIONS

This report summarizes the set up of the project and presents the data. The proceedings of the workshop will include the detailed reports from the subcontracts and recommendations for further work.

Table 1. Forintek Canada

SUMMARY TABLE
GRADE PROPERTIES
(CAN3-0437.0-M85)

Client: A.R.C.
Test Date: September 11, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: As per test Requirement

	Units	Dir'n	Group Number A1 PLPS-60	A2 PLPS-62	A3 PLPS-63	C1 PLPS-59	C2 PLPS-61
Modulus of rupture	MPa	Para	21.8	24.2	22.6	24.7	22.1
Modulus of elasticity	MPa	Para	4900	4600	4600	4000	4100
Internal bond	MPa		0.417	0.469	0.484	0.290	0.389
Bond durability - MOR after 2 h boil	MPa	Para	14.6	13.8	13.2	12.9	12.1
Thickness swell - 24 h soak - thicker than 12.7 mm	%		4	7	6	22	14
Linear expansion - oven dry to saturated	%	Para Perp	0.11 0.10	0.11 0.10	0.14 0.08	0.16 0.21	0.11 0.13
Moisture Content	%	Max. 8.0	4	3	4	5	3
Density	kg./cu.m	No Requirement	632	638	615	640	596

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Table 2. K.C. Shen Technology International Limited

SUMMARY TABLE
GRADE PROPERTIES
(CAN3-0437.0-M85)

Client: A.R.C. Test Material: Shen Board Random
Test Date: July 25 - August 4, 1989 Nom. Thickness: 11.0 & 15.5 mm
Proj.Ref.: 40602000 Conditioning: As per test Requirement

Group 1	Units	(CAN3-0437) R-1 Req.	Dir'n	Panel Number Shen 2	Shen 4	Shen 9	Shen 7
Modulus of rupture	MPa	17.2	Para	18.2	25.1	31.0	23.6
Modulus of elasticity	MPa	3100	Para	4900	6100	6800	5500
Internal bond	MPa	0.345		0.118	0.607	0.228	0.193
Bond durability - MOR after 2 h boil	MPa	8.6	Para	4.3	13.8	14.2	9.4
Linear Expansion - Oven Dry to Saturated	%	0.40 0.40	Para Perp	0.29 0.21	0.30 0.15	0.19 0.24	0.26 0.26
Thickness Swell - 24 Hour Soak							
Less Than 12.7 mm	%	25		6	5	3	-
Greater Than 12.7 mm	%	20		-	-	-	4
Moisture -	%	8.0		1.0	1.0	1.0	1.0
Density -	kg/cu.m	No Requirement		641	799	740	645

* Panel 2,4 and 9 were 11.0 mm
Panel 7 was 15.5 mm

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Appendix A

Forintek Canada Limited
Summary of Results

Moisture Content and Density
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	Test Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	76.0	75.5	16.85	63.5	60.8	4		657	
A1-1	2	75.5	75.5	16.65	60.2	58.1	4	4	634	648
	3	76.0	75.5	16.65	62.3	60.3	3		652	
	1	75.5	75.5	16.70	60.4	58.9	3		634	
A1-2	2	75.0	75.0	17.05	55.8	53.8	4	3	582	616
	3	75.0	75.0	16.95	60.1	58.4	3		630	
No.		6	6	6	6	6	6	2	6	2
Avg.		75.5	75.3	16.81	60.4	58.4	4	4	632	632

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FOREST PRODUCTS LABORATORY

MOR & MOE DRY-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj.Ref.: 40602003

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: As Received
Span: 396.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	16.70	75.8	834	5000		23.4	
A1-1	2	16.78	75.8	767	4300	4600	21.3	21.5
	3	16.84	76.0	714	4600		19.7	
	1	16.56	75.4	830	5400		23.8	
A1-2	2	16.48	75.6	706	5000	5200	20.4	22.1
	3	16.44	75.4	758	5200		22.1	
No.		6	6	6	6	2	6	2
Avg.		16.63	75.7	768	4900	4900	21.8	21.8

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Internal Bond
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj.Ref.: 40602003

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
A1-1	1	49.4	49.0	1103	0.456	0.456
	2	49.2	48.8	1275	0.531	
	3	49.4	49.2	1151	0.474	
	4	49.6	49.0	838	0.345	
	5	49.4	49.0	1206	0.498	
	6	49.6	49.0	1058	0.435	
A1-2	1	49.4	49.0	786	0.325	0.377
	2	49.4	49.2	853	0.351	
	3	49.6	48.6	873	0.362	
	4	49.4	49.2	854	0.351	
	5	49.4	49.0	963	0.398	
	6	49.6	49.2	1164	0.477	
No.		12	12	12	12	2
Avg.		49.5	49.0	1010	0.417	0.417

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FOREST PRODUCTS LABORATORY

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj.Ref.: 40602003
Span: 396.0 mm

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: 2 Hour Boil

Panel No.	Sample	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	16.70	75.8	586	16.5	
A1-1	2	16.80	75.8	536	14.9	15.2
	3	16.80	75.8	518	14.4	
	1	16.56	75.4	552	15.9	
A1-2	2	16.54	75.4	448	12.9	14.0
	3	16.40	75.6	450	13.1	
No.		6	6	6	6	2
Avg.		16.63	75.6	515	14.6	14.6

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FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
A1-1	1	16.65	16.55	16.60	16.65	17.25	17.15	17.50	17.20	4
	2	16.95	16.80	16.85	16.90	17.80	17.40	17.55	17.70	
A1-2	1	16.90	17.10	17.05	16.95	17.35	17.80	18.05	17.60	4
	2	16.85	16.85	16.75	16.70	17.50	17.70	17.10	17.20	
No.		4	4	4	4	4	4	4	4	2
Avg.		16.84	16.83	16.81	16.80	17.48	17.51	17.55	17.43	4

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FOREST PRODUCTS LABORATORY

Linear Expansion-Oven Dry to Saturated
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%
A1-1	1	3	234.05	234.15	234.20	234.45	0.06	0.13
A1-2	1	3	233.75	234.20	234.10	234.35	0.15	0.06
No.			2	2	2	2	2	2
Avg.			233.90	234.18	234.15	234.40	0.11	0.10

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Moisture Content and Density
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	Test Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	75.5	75.5	16.50	57.0	55.4	3		606	
A2-1	2	75.5	75.0	16.50	59.8	58.6	2	2	640	631
	3	75.0	75.5	16.70	61.2	59.8	2		647	
	1	75.5	75.5	16.65	59.8	57.7	4		630	
A2-2	2	75.5	75.5	16.60	57.5	56.1	2	3	608	621
	3	75.5	75.5	17.00	60.6	59.2	2		625	
	1	75.5	75.5	16.65	57.9	55.6	4		610	
A2-3	2	75.5	75.5	16.75	66.1	64.8	2	3	692	661
	3	75.5	75.0	16.55	63.9	62.5	2		682	
No.		9	9	9	9	9	9	3	9	3
Avg.		75.4	75.4	16.66	60.4	58.9	3	3	638	638

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

MOR & MOE DRY-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj.Ref.: 40602003

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: As Received
Span: 396.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	16.56	75.8	716	4600		20.5	
A2-1	2	16.50	75.8	675	3800	4500	19.4	23.0
	3	16.58	75.6	1015	5200		29.0	
	1	16.80	75.6	904	5100		25.2	
A2-2	2	16.76	76.0	762	4300	4800	21.2	23.9
	3	16.76	76.0	907	5000		25.2	
	1	16.50	76.0	879	4500		25.2	
A2-3	2	16.42	75.8	999	5000	4600	29.0	25.8
	3	16.48	75.8	808	4300		23.3	
No.		9	9	9	9	3	9	3
Avg.		16.60	75.8	852	4600	4600	24.2	24.2

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Internal Bond
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj.Ref.: 40602003

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
A2-1	1	49.4	48.6	1180	0.491	0.450
	2	49.8	48.6	1187	0.490	
	3	49.2	48.8	1017	0.424	
	4	49.6	48.8	1041	0.430	
	5	48.8	48.8	1154	0.485	
	6	49.0	48.8	912	0.381	
A2-2	1	49.2	48.6	1272	0.532	0.490
	2	49.6	48.4	1150	0.479	
	3	49.4	48.6	1378	0.574	
	4	49.4	48.8	1136	0.471	
	5	49.4	48.6	1016	0.423	
	6	49.2	48.6	1104	0.462	
A2-3	1	49.6	49.0	1038	0.427	0.467
	2	49.8	48.8	1009	0.415	
	3	49.6	48.6	1163	0.482	
	4	49.8	49.0	1257	0.515	
	5	49.8	48.8	1090	0.449	
	6	49.8	48.6	1237	0.511	
No.		18	18	18	18	3
Avg.		49.5	48.7	1130	0.469	0.469

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FOREST PRODUCTS LABORATORY

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj.Ref.: 40602003
Span: 396.0 mm

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	16.54	76.0	520	14.9	
A2-1	2	16.60	76.0	458	13.0	13.1
	3	16.74	75.8	411	11.5	
	1	16.80	76.0	483	13.4	
A2-2	2	16.80	75.8	443	12.3	13.1
	3	16.84	75.8	489	13.5	
A2-3	1	16.48	75.8	618	17.8	16.0
	2	16.52	75.8	491	14.1	
No.		8	8	8	8	3
Avg.		16.67	75.9	489	13.8	13.8

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	Dry Thickness Position 2	Dry Thickness Position 3	Dry Thickness Position 4	Wet Thickness Position 1	Wet Thickness Position 2	Wet Thickness Position 3	Wet Thickness Position 4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
A2-1	1	16.60	16.75	16.90	16.70	17.70	17.65	17.90	17.85	6
	2	16.85	16.75	16.70	16.80	17.80	17.70	18.05	17.85	
A2-2	1	16.65	16.60	16.60	16.60	17.90	17.60	17.95	18.10	8
	2	16.60	16.65	16.60	16.80	17.80	17.85	17.60	18.50	
A2-3	1	16.50	16.50	16.40	16.50	17.85	17.75	17.45	17.65	7
	2	16.65	16.55	16.65	16.85	17.65	17.70	17.70	18.10	
No.		6	6	6	6	6	6	6	6	3
Avg.		16.64	16.63	16.64	16.71	17.78	17.71	17.78	18.01	7

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Linear Expansion-Oven Dry to Saturated
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%
A2-1	1	3	233.30	232.80	233.60	232.95	0.13	0.06
A2-2	1	3	233.50	233.15	233.80	233.45	0.13	0.13
A2-3	1	3	231.85	232.20	232.05	232.45	0.09	0.11
No.			3	3	3	3	3	3
Avg.			232.88	232.72	233.15	232.95	0.11	0.10

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Moisture Content and Density
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	Test Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	75.5	75.5	16.90	58.9	56.9	4		611	
A3-1	2	75.5	75.0	16.65	58.0	55.6	4	4	615	605
	3	75.0	75.5	16.65	55.4	53.0	5		588	
	1	75.0	75.5	16.90	58.9	57.1	3		615	
A3-2	2	75.5	75.5	16.95	59.0	56.4	5	4	611	626
	3	75.5	75.5	16.85	62.5	60.1	4		651	
No.		6	6	6	6	6	6	2	6	2
Avg.		75.3	75.4	16.82	58.8	56.5	4	4	615	615

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

MOR & MOE DRY-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj.Ref.: 40602003

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: As Received
Span: 396.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	16.68	75.6	846	4400		23.9	
A3-1	2	16.62	76.0	804	4400	4300	22.7	22.8
	3	16.62	75.6	766	4100		21.8	
	1	16.94	75.6	877	4900		24.0	
A3-2	2	16.82	75.6	764	5200	4900	21.2	22.5
	3	16.78	75.6	795	4500		22.2	
No.		6	6	6	6	2	6	2
Avg.		16.74	75.7	809	4600	4600	22.6	22.6

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Internal Bond
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj.Ref.: 40602003

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
A3-1	1	49.4	49.0	1021	0.422	0.493
	2	49.4	48.8	1303	0.541	
	3	49.4	49.0	1149	0.475	
	4	49.8	49.6	1464	0.593	
	5	49.4	48.8	1189	0.493	
	6	49.4	49.0	1054	0.435	
A3-2	1	49.8	48.4	1111	0.461	0.475
	2	50.2	48.8	1146	0.468	
	3	49.8	48.8	1130	0.465	
	4	49.8	49.0	1262	0.517	
	5	50.0	48.8	1097	0.450	
	6	49.8	48.6	1183	0.489	
No.		12	12	12	12	2
Avg.		49.7	48.9	1176	0.484	0.484

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj.Ref.: 40602003
Span: 396.0 mm

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	16.62	75.8	451	12.8	
A3-1	2	16.60	76.2	448	12.7	13.0
	3	16.60	75.6	471	13.4	
	1	16.80	75.8	499	13.9	
A3-2	2	16.78	75.6	517	14.4	13.4
	3	16.78	75.6	424	11.8	
No.		6	6	6	6	2
Avg.		16.70	75.8	468	13.2	13.2

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
A3-1	1	16.55	16.50	16.50	16.55	17.70	17.65	17.40	17.65	6
	2	16.70	16.75	16.90	16.70	17.50	17.80	17.70	17.30	
A3-2	1	16.70	16.75	16.85	16.90	17.60	17.70	18.15	17.95	7
	2	16.50	16.70	16.60	16.50	17.55	17.75	17.95	17.55	
No.		4	4	4	4	4	4	4	4	2
Avg.		16.61	16.68	16.71	16.66	17.59	17.73	17.80	17.61	6

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Linear Expansion-Oven Dry to Saturated
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%
A3-1	1	3	233.90	234.15	234.20	234.25	0.13	0.04
A3-2	1	3	233.35	232.65	233.70	232.90	0.15	0.11
No.			2	2	2	2	2	2
Avg.			233.63	233.40	233.95	233.58	0.14	0.08

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Moisture Content and Density
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	Test Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	75.5	75.0	17.05	63.9	61.3	4		662	
C1-1	2	70.0	75.0	17.45	58.3	55.3	5	5	636	651
	3	75.5	69.0	17.40	59.4	56.7	5		655	
	1	75.5	75.5	17.50	66.1	63.2	5		663	
C1-2	2	75.5	75.5	17.50	58.5	55.6	5	5	586	629
	3	75.0	76.0	17.70	64.3	61.3	5		637	
No.		6	6	6	6	6	6	2	6	2
Avg.		74.5	74.3	17.43	61.8	58.9	5	5	640	640

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

MOR & MOE DRY-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj.Ref.: 40602003

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: As Received
Span: 396.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	17.02	75.2	1023	4200		27.9	
C1-1	2	17.02	75.4	958	4200	4200	26.0	27.2
	3	17.04	75.2	1022	4100		27.8	
	1	17.38	75.6	938	4200		24.4	
C1-2	2	17.40	75.8	727	3500	3900	18.8	22.2
	3	17.46	75.8	910	4000		23.4	
No.		6	6	6	6	2	6	2
Avg.		17.22	75.5	930	4000	4000	24.7	24.7

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Internal Bond
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj.Ref.: 40602003

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
C1-1	1	49.6	49.0	587	0.242	0.227
	2	49.6	49.2	744	0.305	
	3	49.6	48.6	508	0.211	
	4	49.6	47.6	516	0.219	
	5	49.4	48.6	392	0.163	
	6	50.0	48.8	544	0.223	
C1-2	1	50.2	49.4	978	0.394	0.353
	2	49.8	49.0	904	0.370	
	3	49.8	48.8	848	0.349	
	4	49.6	49.4	872	0.356	
	5	50.2	49.0	933	0.379	
	6	49.6	48.6	652	0.270	
No.		12	12	12	12	2
Avg.		49.8	48.8	707	0.290	0.290

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj.Ref.: 40602003
Span: 396.0 mm

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	16.96	75.2	456	12.5	
C1-1	2	17.10	75.6	520	14.0	13.5
	3	17.14	75.2	518	13.9	
	1	17.56	75.6	495	12.6	
C1-2	2	17.66	75.8	407	10.2	12.2
	3	17.70	75.6	553	13.9	
No.		6	6	6	6	2
Avg.		17.35	75.5	492	12.9	12.9

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
C1-1	1	16.85	16.90	16.95	16.90	20.18	19.60	20.35	19.70	17
	2	17.25	17.20	17.20	17.00	20.20	20.45	19.65	18.95	
C1-2	1	17.40	17.35	17.25	17.25	21.50	22.75	22.05	21.90	26
	2	17.70	17.50	17.60	17.50	22.15	22.10	22.35	21.45	
No.		4	4	4	4	4	4	4	4	2
Avg.		17.30	17.24	17.25	17.16	21.01	21.23	21.10	20.50	22

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Linear Expansion-Oven Dry to Saturated
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%
C1-1	1	3	233.20	233.35	233.50	233.80	0.13	0.19
C1-2	1	3	233.25	233.15	233.70	233.70	0.19	0.24
No.			2	2	2	2	2	2
Avg.			233.23	233.25	233.60	233.75	0.16	0.21

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Moisture Content and Density
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	Test Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	75.0	75.5	16.60	54.5	52.8	3		580	
C2-1	2	76.0	76.0	16.65	50.6	49.0	3	3	526	559
	3	76.0	76.0	16.65	55.0	53.2	3		572	
	1	75.5	75.5	17.00	60.0	58.2	3		619	
C2-2	2	75.5	76.0	17.00	61.9	60.0	3	3	635	633
	3	75.5	76.0	16.85	62.4	60.6	3		645	
No.		6	6	6	6	6	6	2	6	2
Avg.		75.6	75.8	16.79	57.4	55.6	3	3	596	596

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

MOR & MOE DRY-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj.Ref.: 4060200?

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: As Received
Span: 396.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	16.52	75.4	581	3500		16.8	
C2-1	2	16.64	75.4	734	3700	3600	20.9	18.4
	3	16.70	75.2	622	3500		17.6	
	1	16.90	75.8	1015	4700		27.8	
C2-2	2	16.92	75.8	897	4500	4600	24.5	25.8
	3	16.94	76.0	920	4500		25.1	
No.		6	6	6	6	2	6	2
Avg.		16.77	75.6	795	4100	4100	22.1	22.1

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Internal Bond
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj.Ref.: 40602003

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
C2-1	1	49.6	48.8	884	0.365	0.359
	2	49.6	49.2	892	0.366	
	3	49.6	49.4	899	0.367	
	4	49.6	48.8	779	0.322	
	5	49.6	49.4	827	0.338	
	6	49.6	49.2	971	0.398	
C2-2	1	50.0	49.0	857	0.350	0.419
	2	49.8	48.8	1173	0.483	
	3	49.8	49.4	833	0.339	
	4	49.8	49.4	1119	0.455	
	5	50.2	49.8	1161	0.464	
	6	49.8	48.8	1036	0.426	
No.		12	12	12	12	2
Avg.		49.8	49.2	953	0.389	0.389

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj.Ref.: 40602003
Span: 396.0 mm

Test Material: O.S.B
Nom. Thickness: 16.5 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	16.58	75.2	386	11.1	
C2-1	2	16.60	75.4	324	9.3	10.0
	3	16.70	75.4	339	9.6	
	1	16.88	76.0	470	12.9	
C2-2	2	16.90	75.8	524	14.4	14.3
	3	17.04	75.8	580	15.7	
No.		6	6	6	6	2
Avg.		16.78	75.6	437	12.1	12.1

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 7, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
C2-1	1	16.55	16.50	16.45	16.55	19.05	19.45	18.60	18.85	14
	2	16.95	16.70	16.80	16.70	19.45	19.55	18.90	18.60	
C2-2	1	16.80	16.75	16.75	16.70	19.55	18.75	19.15	19.05	13
	2	17.10	17.05	17.00	17.20	19.00	18.90	19.55	19.00	
No.		4	4	4	4	4	4	4	4	2
Avg.		16.85	16.75	16.75	16.79	19.26	19.16	19.05	18.88	14

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Linear Expansion-Oven Dry to Saturated
(CAN3-0437-M85)

Client: A.R.C.
Test Date: September 8, 1989
Proj. Ref.: 40602003

Test Material: O.S.B.
Nom. Thickness: 16.5 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%
C2-1	1	3	233.20	233.15	233.50	233.35	0.13	0.09
C2-2	1	3	231.10	233.20	231.30	233.60	0.09	0.17
No.			2	2	2	2	2	2
Avg.			232.15	233.18	232.40	233.48	0.11	0.13

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Appendix B

Reichhold Limited
Initial Results

Thickness Swell
Summary
(CAN3-0437-M85)

Client: A,R,C
Test Date: February 15, 1990
Proj. Ref.: 40602000

Test Material: Waferboard Random
Nom. Thickness: 18.5 mm
Conditioning: 168 hr Soak

Group No.	Sample No.	Sample Thickness Swell (%)							
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Oven Dry
T6-1	1	5	9	11	13	17	19	19	13
	2	5	9	11	13	18	19	18	13
T7-1	1	6	10	13	14	19	20	20	14
	2	6	9	11	13	17	18	18	11
T10-1	1	5	8	11	13	17	18	19	10
	2	5	9	12	14	18	19	16	13
T13-1	1	5	10	14	16	21	22	22	13
	2	5	9	14	18	23	25	25	17
B7-1	1	5	9	12	16	20	18	21	12
	2	5	9	12	15	18	22	19	10

T6-1,T7-1,T10-1 Reichold BD905 Resin - 6%

T13-1,B7-1 Reichold IB947 - 4%

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: January 30, 1990
Proj. Ref.: 40602000

Test Material: Waferboard, Random
Nom. Thickness: 18.5 mm.
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
T6-1	1	19.25	19.35	19.35	19.50	20.05	20.20	20.50	20.55	5	5
	2	19.40	19.30	19.45	19.40	20.50	20.25	20.45	20.45	5	
T7-1	1	19.80	19.55	19.50	19.75	21.15	20.50	20.80	20.90	6	6
	2	19.65	19.40	19.35	19.40	20.95	20.50	20.55	20.55	6	
T10-1	1	19.15	19.55	19.55	19.65	20.05	20.60	20.55	20.65	5	5
	2	19.40	19.65	19.65	19.55	20.35	20.75	20.45	20.90	5	
T13-1	1	19.60	19.45	19.45	19.45	20.35	20.40	20.45	20.85	5	5
	2	19.45	19.45	19.55	19.60	20.45	20.35	20.60	20.60	5	
B7-1	1	19.95	19.70	19.85	19.90	20.95	20.60	20.90	20.90	5	5
	2	19.65	19.70	19.70	19.55	20.70	20.55	20.50	20.80	5	
No.		10	10	10	10	10	10	10	10	10	5
Avg.		19.53	19.51	19.54	19.58	20.55	20.47	20.58	20.72	5	5
St.Dev.		0.25	0.14	0.16	0.16	0.38	0.17	0.16	0.17	0.42	0.43
C.V.		1.26%	0.73%	0.81%	0.81%	1.85%	0.83%	0.75%	0.84%	7.94%	8.11%

T6-1,T7-1,T10-1 Reichold BD905 Resin - 6%.

T13-1,B7-1 Reichold IB947 Resin - 4%

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: January 31, 1990
Proj. Ref.: 40602000

Test Material: Waferboard, Random
Nom. Thickness: 18.5 mm.
Conditioning: 48 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	Dry Thickness Position 2	Dry Thickness Position 3	Dry Thickness Position 4	Wet Thickness Position 1	Wet Thickness Position 2	Wet Thickness Position 3	Wet Thickness Position 4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
T6-1	1	19.25	19.35	19.35	19.50	20.80	20.90	21.30	21.25	9	9
	2	19.40	19.30	19.45	19.40	21.20	20.95	21.05	21.20	9	
T7-1	1	19.80	19.55	19.50	19.75	21.90	21.10	21.90	21.55	10	10
	2	19.65	19.40	19.35	19.40	21.65	21.10	21.10	21.25	9	
T10-1	1	19.15	19.55	19.55	19.65	20.55	21.40	21.15	21.35	8	9
	2	19.40	19.65	19.65	19.55	20.90	21.60	21.05	21.70	9	
T13-1	1	19.60	19.45	19.45	19.45	21.10	21.50	21.25	21.85	10	10
	2	19.45	19.45	19.55	19.60	21.35	21.05	21.60	21.40	9	
B7-1	1	19.95	19.70	19.85	19.90	21.65	21.30	21.70	21.60	9	9
	2	19.65	19.70	19.70	19.55	21.45	21.15	21.15	21.55	9	
No.		10	10	10	10	10	10	10	10	10	5
Avg.		19.53	19.51	19.54	19.58	21.26	21.21	21.33	21.47	9	9
St.Dev.		0.25	0.14	0.16	0.16	0.43	0.24	0.30	0.21	0.57	0.55
C.V.		1.26%	0.73%	0.81%	0.81%	2.00%	1.11%	1.41%	1.00%	6.26%	6.07%

T6-1,T7-1,T10-1 Reichold BD905 Resin - 6%.

T13-1,B7-1 Reichold IB947 Resin - 4%

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 1, 1990
Proj. Ref.: 40602000

Test Material: Waferboard, Random
Nom. Thickness: 18.5 mm.
Conditioning: 72 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	Dry Thickness Position 2	Dry Thickness Position 3	Dry Thickness Position 4	Wet Thickness Position 1	Wet Thickness Position 2	Wet Thickness Position 3	Wet Thickness Position 4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
T6-1	1	19.25	19.35	19.35	19.50	21.20	21.40	21.55	21.45	11	11
	2	19.40	19.30	19.45	19.40	21.55	21.40	21.70	21.80	11	
T7-1	1	19.80	19.55	19.50	19.75	22.45	21.70	22.35	21.95	13	12
	2	19.65	19.40	19.35	19.40	21.85	21.65	21.55	21.60	11	
T10-1	1	19.15	19.55	19.55	19.65	20.90	21.85	21.60	21.85	11	11
	2	19.40	19.65	19.65	19.55	21.30	22.15	21.60	22.25	12	
T13-1	1	19.60	19.45	19.45	19.45	21.85	22.20	21.90	22.60	14	14
	2	19.45	19.45	19.55	19.60	22.25	21.60	22.65	22.45	14	
B7-1	1	19.95	19.70	19.85	19.90	22.40	21.95	22.30	22.25	12	12
	2	19.65	19.70	19.70	19.55	22.20	22.15	21.85	22.05	12	
No.		10	10	10	10	10	10	10	10	10	5
Avg.		19.53	19.51	19.54	19.58	21.80	21.81	21.91	22.03	12	12
St.Dev.		0.25	0.14	0.16	0.16	0.54	0.30	0.39	0.37	1.14	1.12
C.V.		1.26%	0.73%	0.81%	0.81%	2.48%	1.39%	1.80%	1.67%	9.48%	9.31%

T6-1,T7-1,T10-1 Reichold BD905 Resin - 6%.

T13-1,B7-1 Reichold IB947 Resin - 4%

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 2, 1990
Proj. Ref.: 40602000

Test Material: Waferboard, Random
Nom. Thickness: 18.5 mm.
Conditioning: 96 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
T6-1	1	19.25	19.35	19.35	19.50	21.50	21.85	22.15	22.10	13	13
	2	19.40	19.30	19.45	19.40	21.90	21.85	22.00	22.25	13	
T7-1	1	19.80	19.55	19.50	19.75	22.95	22.20	22.35	22.40	14	14
	2	19.65	19.40	19.35	19.40	22.20	22.20	21.95	21.85	13	
T10-1	1	19.15	19.55	19.55	19.65	21.25	22.45	21.90	22.25	13	13
	2	19.40	19.65	19.65	19.55	21.80	22.80	22.15	22.60	14	
T13-1	1	19.60	19.45	19.45	19.45	21.55	22.85	22.65	23.00	16	17
	2	19.45	19.45	19.55	19.60	23.05	22.25	23.55	23.20	18	
B7-1	1	19.95	19.70	19.85	19.90	23.10	22.85	22.90	22.95	16	15
	2	19.65	19.70	19.70	19.55	22.70	22.65	22.30	22.50	15	
No.		10	10	10	10	10	10	10	10	10	5
Avg.		19.53	19.51	19.54	19.58	22.20	22.40	22.39	22.51	15	15
St.Dev.		0.25	0.14	0.16	0.16	0.70	0.39	0.51	0.43	1.55	1.44
C.V.		1.26%	0.73%	0.81%	0.81%	3.15%	1.72%	2.30%	1.91%	10.66%	9.93%

T6-1,T7-1,T10-1 Reichold BD905 Resin - 6%.

T13-1,B7-1 Reichold IB3947 Resin - 4%

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 3, 1990
Proj. Ref.: 40602000

Test Material: Waferboard, Random
Nom. Thickness: 18.5 mm,
Conditioning: 120 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
T6-1	1	19.25	19.35	19.35	19.50	22.15	22.70	23.00	22.55	17	17
	2	19.40	19.30	19.45	19.40	22.75	22.70	23.10	22.85	18	
T7-1	1	19.80	19.55	19.50	19.75	23.80	22.90	23.50	23.15	19	18
	2	19.65	19.40	19.35	19.40	22.75	22.85	22.70	22.50	17	
T10-1	1	19.15	19.55	19.55	19.65	22.25	23.15	22.70	22.90	17	17
	2	19.40	19.65	19.65	19.55	22.65	23.50	22.80	23.35	18	
T13-1	1	19.60	19.45	19.45	19.45	23.55	23.60	23.70	23.45	21	22
	2	19.45	19.45	19.55	19.60	24.00	23.65	24.40	23.95	23	
B7-1	1	19.95	19.70	19.85	19.90	24.30	23.05	23.65	23.90	20	19
	2	19.65	19.70	19.70	19.55	23.40	23.40	22.85	22.95	18	
No.		10	10	10	10	10	10	10	10	10	5
Avg.		19.53	19.51	19.54	19.58	23.16	23.15	23.24	23.16	19	19
St.Dev.		0.25	0.14	0.16	0.16	0.75	0.37	0.56	0.51	2.05	1.96
C.V.		1.26%	0.73%	0.81%	0.81%	3.24%	1.58%	2.40%	2.19%	11.00%	10.54%

T6-1,T7-1,T10-1 Reichold BD905 Resin - 6%.

T13-1,B7-1 Reichold IB3947 Resin - 4%

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 4,1990
Proj. Ref.: 40602000

Test Material: Waferboard, Random
Nom. Thickness: 18.5 mm.
Conditioning: 144 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
T6-1	1	19.25	19.35	19.35	19.50	23.30	22.80	23.20	22.65	19	19
	2	19.40	19.30	19.45	19.40	22.90	22.85	23.30	23.25	19	
T7-1	1	19.80	19.55	19.50	19.75	24.05	23.20	23.35	23.35	20	19
	2	19.65	19.40	19.35	19.40	22.90	23.05	22.90	22.75	18	
T10-1	1	19.15	19.55	19.55	19.65	22.30	23.40	22.85	23.15	18	19
	2	19.40	19.65	19.65	19.55	22.80	23.85	23.20	23.60	19	
T13-1	1	19.60	19.45	19.45	19.45	23.70	23.75	23.80	24.05	22	23
	2	19.45	19.45	19.55	19.60	24.25	24.00	24.80	24.25	25	
B7-1	1	19.95	19.70	19.85	19.90	23.60	23.65	23.15	23.20	18	20
	2	19.65	19.70	19.70	19.55	24.30	23.45	24.05	24.15	22	
No.		10	10	10	10	10	10	10	10	10	5
Avg.		19.53	19.51	19.54	19.58	23.41	23.40	23.46	23.44	20	20
St.Dev.		0.25	0.14	0.16	0.16	0.68	0.42	0.60	0.56	2.33	2.07
C.V.		1.26%	0.73%	0.81%	0.81%	2.91%	1.79%	2.55%	2.40%	11.73%	10.39%

T6-1,T7-1,T10-1 Reichold BD905 Resin - 6%.

T13-1,B7-1 Reichold IB3947 Resin - 4%

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 5,1990
Proj. Ref.: 40602000

Test Material: Waferboard, Random
Nom. Thickness: 18.5 mm.
Conditioning: 168 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	Dry Thickness Position 2	Dry Thickness Position 3	Dry Thickness Position 4	Wet Thickness Position 1	Wet Thickness Position 2	Wet Thickness Position 3	Wet Thickness Position 4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
T6-1	1	19.25	19.35	19.35	19.50	23.40	22.85	23.25	23.00	19	19
	2	19.40	19.30	19.45	19.40	22.75	22.75	23.10	23.20	18	
T7-1	1	19.80	19.55	19.50	19.75	24.10	23.20	23.35	23.40	20	19
	2	19.65	19.40	19.35	19.40	22.95	23.10	22.95	22.65	18	
T10-1	1	19.15	19.55	19.55	19.65	22.70	22.95	23.10	23.60	19	18
	2	19.40	19.65	19.65	19.55	21.90	23.20	22.85	23.20	16	
T13-1	1	19.60	19.45	19.45	19.45	23.75	23.70	23.75	23.75	22	23
	2	19.45	19.45	19.55	19.60	24.35	24.25	24.75	24.20	25	
B7-1	1	19.95	19.70	19.85	19.90	24.40	23.50	24.10	24.40	21	20
	2	19.65	19.70	19.70	19.55	23.55	23.80	23.20	23.05	19	
No.		10	10	10	10	10	10	10	10	10	5
Avg.		19.53	19.51	19.54	19.58	23.39	23.33	23.44	23.45	20	20
St.Dev.		0.25	0.14	0.16	0.16	0.81	0.48	0.59	0.55	2.42	2.25
C.V.		1.26%	0.73%	0.81%	0.81%	3.46%	2.04%	2.53%	2.34%	12.25%	11.40%

T6-1,T7-1,T10-1 Reichold BD905 Resin - 6%.

T13-1,B7-1 Reichold IB3947 Resin - 4%

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 9, 1990
Proj. Ref.: 40602000

Test Material: Waferboard, Random
Nom. Thickness: 18.5 mm.
Conditioning: 168 hr Soak Then Oven Dry

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
T6-1	1	19.25	19.35	19.35	19.50	21.20	21.80	22.25	22.05	13	13
	2	19.40	19.30	19.45	19.40	21.70	21.80	22.00	22.05	13	
T7-1	1	19.80	19.55	19.50	19.75	23.10	22.15	22.35	22.15	14	13
	2	19.65	19.40	19.35	19.40	21.50	22.05	21.70	21.20	11	
T10-1	1	19.15	19.55	19.55	19.65	20.40	22.05	21.30	21.95	10	11
	2	19.40	19.65	19.65	19.55	21.30	22.75	21.95	22.05	13	
T13-1	1	19.60	19.45	19.45	19.45	22.35	21.90	22.05	22.10	13	15
	2	19.45	19.45	19.55	19.60	22.40	23.00	23.15	22.85	17	
B7-1	1	19.95	19.70	19.85	19.90	22.40	21.70	22.50	22.70	12	11
	2	19.65	19.70	19.70	19.55	21.90	22.15	21.55	21.25	10	
No.		10	10	10	10	10	10	10	10	10	5
Avg.		19.53	19.51	19.54	19.58	21.83	22.14	22.08	22.04	13	13
St.Dev.		0.25	0.14	0.16	0.16	0.77	0.42	0.53	0.52	2.02	1.59
C.V.		1.26%	0.73%	0.81%	0.81%	3.54%	1.91%	2.38%	2.37%	15.93%	12.50%

T6-1,T7-1,T10-1 Reichold BD905 Resin - 6%.

T13-1,B7-1 Reichold IB3947 Resin - 4%

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Appendix C

K.C. Shen Technology International Limited
Summary of Test Results

Moisture Content and Density
(CAN3-0437-M85)

Client: A.R.C.
Test Date: July 27, 1989
Proj. Ref.: 40602000

Test Material: Shen Board Random
Nom. Thickness: 11.0 mm
Conditioning: Oven.Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	Test Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	75.0	75.0	12.35	42.7	42.3	1		615	
Shen 2	2	75.0	75.0	12.50	46.4	46.1	1	1	660	641
	3	75.0	75.0	12.50	45.6	45.1	1		649	
	1	75.0	75.0	10.10	46.0	45.7	1		810	
Shen 4	2	75.0	75.0	9.75	44.6	44.3	1	1	813	799
	3	75.0	75.0	9.75	42.5	42.3	0		775	
	1	75.5	75.5	10.55	47.2	46.9	1		785	
Shen 9	2	75.0	75.5	10.45	44.7	44.3	1	1	755	740
	3	75.0	75.5	10.10	38.8	38.5	1		678	
No.		9	9	9	9	9	9	3	9	3
Avg.		75.1	75.2	10.89	44.3	43.9	1	1	727	727

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Moisture Content and Density
(CAN3-0437-M85)

Client: A.R.C.
Test Date: July 27, 1989
Proj. Ref.: 40602000

Test Material: Shen Board Random
Nom. Thickness: 15.5 mm
Conditioning: Oven Dry& at Test

Panel No.	Sample No.	Length	Width	Thick-ness	Test Weight	O.D. Weight	M.C.	Avg. M.C.	Density at Test	Avg. Density at Test
		mm	mm	mm	g	g	%	%	kg/cu.m	kg/cu.m
	1	75.5	75.5	15.85	54.7	54.0	1		605	
Shen 7	2	75.0	75.5	15.95	57.7	57.1	1	1	639	645
	3	75.0	75.5	15.95	62.5	61.9	1		692	
No.		3	3	3	3	3	3	1	3	1
Avg.		75.2	75.5	15.92	58.3	57.7	1	1	645	645

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

MOR & MOE DRY-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: July 25, 1989
Proj.Ref.: 40602000

Test Material: Shen Board Random
Nom. Thickness: 11.0 mm
Conditioning: As Received
Span: 264.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	12.10	75.0	475	4300		17.1	
Shen 2	2	12.00	75.2	518	5200	4900	18.9	18.2
	3	12.00	75.2	510	5100		18.7	
	1	9.80	75.4	467	6200		25.5	
Shen 4	2	9.76	75.6	445	6400	6100	24.5	25.1
	3	9.82	75.6	465	5700		25.3	
	1	10.30	75.2	644	6700		32.0	
Shen 9	2	10.32	75.2	610	7100	6800	30.2	31.0
	3	10.34	75.0	626	6700		30.9	
No.		9	9	9	9	3	9	3
Avg.		10.72	75.3	529	5900	5900	24.8	24.8

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

MOR & MOE DRY-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: July 25, 1989
Proj.Ref.: 40602000

Test Material: Shen Board Random
Nom. Thickness: 15.5 mm
Conditioning: As Received
Span: 372.0 mm

Panel No.	Sample No.	Thick-ness	Width	Max. Load	MOE	Avg. MOE	MOR	Avg. MOR
		mm	mm	N	MPa	MPa	MPa	MPa
	1	16.02	75.4	862	5000		24.9	
Shen 7	2	15.88	75.4	848	5800	5500	24.9	23.6
	3	15.88	75.4	714	5700		21.0	
No.		3	3	3	3	1	3	1
Avg.		15.93	75.4	808	5500	5500	23.6	23.6

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Internal Bond
(CAN3-0437-M85)

Client: A.R.C.
Test Date: July 25, 1989
Proj.Ref.: 40602000

Test Material: Shen Board Random
Nom. Thickness: 11.0 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
Shen 2	1	50.0	50.2	394	0.157	0.118
	2	50.0	50.2	220	0.088	
	3	50.2	50.2	207	0.082	
	4	50.0	50.0	367	0.147	
	5	50.0	50.2	329	0.131	
	6	50.2	50.0	252	0.100	
Shen 4	1	50.0	49.8	708 *	0.284	0.607
	2	50.0	49.8	1660 *	0.667	
	3	49.8	50.2	1534 *	0.614	
	4	49.8	49.8	1405 *	0.567	
	5	50.0	50.0	1645 *	0.658	
	6	50.0	50.0	2126 *	0.850	
Shen 9	1	50.0	50.2	761 *	0.303	0.228
	2	50.0	50.0	271	0.108	
	3	50.0	50.0	368	0.147	
	4	50.0	50.0	766 *	0.306	
	5	50.2	50.0	338	0.135	
	6	50.2	50.0	920	0.367	
No.		18	18	18	18	3
Avg.		50.0	50.0	790	0.317	0.317

* - Reglued

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Internal Bond
(CAN3-0437-M85)

Client: A.R.C.
Test Date: July 25, 1989
Proj.Ref.: 40602000

Test Material: Shen Board Random
Nom. Thickness: 15.5 mm
Conditioning: As Received

Panel No.	Sample Number	Sample Length	Sample Width	Maximum Load	Internal Bond Strength	Average For Panel
		mm	mm	N	MPa	MPa
Shen 7	1	50.0	49.8	586 *	0.235	0.193
	2	50.0	49.8	751 *	0.302	
	3	50.0	50.0	208	0.083	
	4	50.0	50.0	267	0.107	
	5	50.0	50.0	644	0.258	
	6	50.2	49.8	428	0.171	
No.		6	6	6	6	1
Avg.		50.0	49.9	480	0.193	0.193

* - Reglued

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: July 25, 1989
Proj.Ref.: 40602000
Span: 264.0 mm

Test Material: Shen Board Random
Nom. Thickness: 11.0 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	12.00	75.0	105	3.9	
Shen 2	2	12.00	75.0	94	3.4	4.3
	3	11.66	75.0	142	5.5	
	1	10.24	75.6	275	13.7	
Shen 4	2	10.46	75.4	249	12.0	13.8
	3	10.16	75.4	308	15.7	
	1	10.62	75.2	342	16.0	
Shen 9	2	10.68	75.0	307	14.2	14.2
	3	10.76	75.4	271	12.3	
No.		9	9	9	9	3
Avg.		10.95	75.2	233	10.7	10.7

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Bond Durability-MOR after 2 Hour Boil-Parallel
(CAN3-0437-M85)

Client: A.R.C.
Test Date: July 25, 1989
Proj.Ref.: 40602000
Span: 372.0 mm

Test Material: Shen Board Random
Nom. Thickness: 15.5 mm
Conditioning: 2 Hour Boil

Panel No.	Sample No.	Sample Thickness	Sample Width	Maximum Load	MOR	Average MOR for Panel
		mm	mm	N	MPa	MPa
	1	15.86	75.2	321	9.5	
Shen 7	2	15.80	75.4	310	9.2	9.4
	3	15.84	75.4	328	9.7	
No.		3	3	3	3	1
Avg.		15.83	75.3	320	9.4	9.4

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Linear Expansion-Oven Dry to Saturated
(CAN3-0437-M85)

Client: A.R.C.
Test Date: August 4, 1989
Proj. Ref.: 40602000

Test Material: Shen Board Random
Nom. Thickness: 11.0 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%
Shen 2	1	3	221.00	232.75	221.65	233.25	0.29	0.21
Shen 4	1	3	232.00	229.20	232.70	229.55	0.30	0.15
Shen 9	1	3	234.00	233.25	234.45	233.80	0.19	0.24
No.			3	3	3	3	3	3
Avg.			229.00	231.73	229.60	232.20	0.26	0.20

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Linear Expansion-Oven Dry to Saturated
(CAN3-0437-M85)

Client: A.R.C.
Test Date: August 4, 1989
Proj. Ref.: 40602000

Test Material: Shen Board Random
Nom. Thickness: 15.5 mm
Conditioning: OD to Saturated

Panel No.	Sample No.		Oven Dry Gauge Length		Vac.-Pressure Gauge Length		Linear Expansion	
	Par.	Perp.	Par.	Perp.	Par.	Perp.	Par.	Perp.
			mm	mm	mm	mm	%	%
Shen 7	1	3	234.50	234.20	235.10	234.80	0.26	0.26
No.			1	1	1	1	1	1
Avg.			234.50	234.20	235.10	234.80	0.26	0.26

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: August 2, 1989
Proj. Ref.: 40602000

Test Material: Shen Board Random
Nom. Thickness: 11.0 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
Shen-2	1	12.20	12.00	12.00	12.05	12.85	12.70	12.65	12.75	6
Shen-4	1	10.40	10.50	10.60	10.35	11.00	11.10	11.05	10.90	5
Shen-9	1	10.65	10.70	10.65	10.55	11.00	11.10	11.00	10.90	3
No.		3	3	3	3	3	3	3	3	3
Avg.		11.08	11.07	11.08	10.98	11.62	11.63	11.57	11.52	5

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: August 2, 1989
Proj. Ref.: 40602000

Test Material: Shen Board Random
Nom. Thickness: 15.5 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Average Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%
Shen-7	1	15.90	15.90	15.95	15.80	16.50	16.55	16.55	16.40	4
No.		1	1	1	1	1	1	1	1	1
Avg.		15.90	15.90	15.95	15.80	16.50	16.55	16.55	16.40	4

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
Summary
(CAN3-0437-M85)

Client: A,R,C
Test Date: February 15, 1990
Proj. Ref. : 40602000

Test Material: Shenboard
Nom. Thickness: 11.0 mm / 15.5 mm
Conditioning: 168 hr Soak

Group No.	Sample No.	Sample Thickness Swell (%)							
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Oven Dry
SHEN-1	1	4	5	7	8	12	12	14	4
	2	3	5	6	8	11	13	13	3
SHEN-2	1	4	6	9	11	15	17	18	6
	2	5	6	9	12	16	18	19	7
SHEN-7	1	3	4	7	9	13	15	16	7
	2	3	5	7	9	14	15	17	7
SHEN-8	1	2	3	4	6	8	9	10	2
	2	2	3	4	5	7	9	9	3

Shen 1, Shen 2, Lignin Resin - Face 10%, Core - 8%
Shen 7, Lignin Resin - 8%
Shen 8, Lignin Resin - 10%

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ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: January 30, 1990
Proj. Ref.: 40602000

Test Material: Shenboard
Nom. Thickness: 11.0 mm / 15.5 mm
Conditioning: 24 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	Dry Thickness Position 2	Dry Thickness Position 3	Dry Thickness Position 4	Wet Thickness Position 1	Wet Thickness Position 2	Wet Thickness Position 3	Wet Thickness Position 4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
Shen 1	1	9.60	9.65	9.65	9.65	9.95	10.00	10.00	10.05	4	4
	2	9.70	9.75	9.65	9.90	10.05	10.10	10.00	10.15	3	
Shen 2	1	10.80	10.95	10.90	10.90	11.15	11.55	11.45	11.35	4	5
	2	10.90	11.00	10.95	11.10	11.40	11.45	11.55	11.55	5	
Shen 7	1	15.70	15.65	15.60	15.75	16.10	16.00	16.10	16.20	3	3
	2	15.70	15.55	16.05	15.65	16.05	16.25	16.40	16.15	3	
Shen 8	1	16.75	16.80	16.70	16.50	17.05	17.15	17.05	16.80	2	2
	2	16.80	16.95	16.90	16.80	17.15	17.20	17.20	17.15	2	
No.		8	8	8	8	8	8	8	8	8	4
Avg.		13.24	13.29	13.30	13.28	13.61	13.71	13.72	13.68	3	3
St.Dev.		3.26	3.23	3.28	3.15	3.24	3.21	3.24	3.16	1.03	1.10
C.V.		24.60%	24.29%	24.66%	23.72%	23.81%	23.43%	23.63%	23.10%	32.16%	34.39%

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Shen 1, Shen 2, Lignin Resin - Face 10%, Core 8%

Shen 7, Lignin Resin - 8%

Shen 8, Lignin Resin - 10%

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: January 31, 1990
Proj. Ref.: 40602000

Test Material: Shenboard
Nom. Thickness: 11.0 mm / 15.5 mm
Conditioning: 48 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
Shen 1	1	9.60	9.65	9.65	9.65	10.10	10.10	10.10	10.20	5	5
	2	9.70	9.75	9.65	9.90	10.25	10.25	10.15	10.20	5	
Shen 2	1	10.80	10.95	10.90	10.90	11.35	11.75	11.65	11.55	6	6
	2	10.90	11.00	10.95	11.10	11.60	11.55	11.80	11.65	6	
Shen 7	1	15.70	15.65	15.60	15.75	16.35	16.20	16.35	16.45	4	5
	2	15.70	15.55	16.05	15.65	16.30	16.70	16.70	16.35	5	
Shen 8	1	16.75	16.80	16.70	16.50	17.25	17.30	17.25	16.95	3	3
	2	16.80	16.95	16.90	16.80	17.30	17.25	17.35	17.35	3	
No.		8	8	8	8	8	8	8	8	8	4
Avg.		13.24	13.29	13.30	13.28	13.81	13.89	13.92	13.84	5	5
St.Dev.		3.26	3.23	3.28	3.15	3.25	3.25	3.27	3.20	1.30	1.38
C.V.		24.60%	24.29%	24.66%	23.72%	23.55%	23.38%	23.51%	23.12%	28.05%	29.80%

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Shen 1, Shen 2, Lignin Resin - Face 10%, Core 8%

Shen 7, Lignin Resin - 8%

Shen 8, Lignin Resin - 10%

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 1, 1990
Proj. Ref.: 40602000

Test Material: Shenboard
Nom. Thickness: 11.0 mm / 15.5 mm
Conditioning: 72 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
Shen 1	1	9.60	9.65	9.65	9.65	10.30	10.35	10.35	10.35	7	7
	2	9.70	9.75	9.65	9.90	10.30	10.40	10.30	10.40	6	
Shen 2	1	10.80	10.95	10.90	10.90	11.50	12.05	11.90	11.85	9	9
	2	10.90	11.00	10.95	11.10	11.95	11.85	12.10	11.95	9	
Shen 7	1	15.70	15.65	15.60	15.75	16.75	16.45	16.80	16.80	7	7
	2	15.70	15.55	16.05	15.65	16.55	17.00	17.00	16.70	7	
Shen 8	1	16.75	16.80	16.70	16.50	17.40	17.50	17.40	17.15	4	4
	2	16.80	16.95	16.90	16.80	17.50	17.55	17.55	17.50	4	
No.		8	8	8	8	8	8	8	8	8	4
Avg.		13.24	13.29	13.30	13.28	14.03	14.14	14.18	14.09	7	7
St.Dev.		3.26	3.23	3.28	3.15	3.29	3.26	3.29	3.21	1.83	1.95
C.V.		24.60%	24.29%	24.66%	23.72%	23.44%	23.05%	23.21%	22.82%	28.08%	29.87%

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Shen 1, Shen 2, Lignin Resin - Face 10%, Core 8%

Shen 7, Lignin Resin - 8%

Shen 8, Lignin Resin - 10%

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 2, 1990
Proj. Ref.: 40602000

Test Material: Shenboard
Nom. Thickness: 11.0 mm / 15.5 mm
Conditioning: 96 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
Shen 1	1	9.60	9.65	9.65	9.65	10.40	10.45	10.50	10.45	8	8
	2	9.70	9.75	9.65	9.90	10.55	10.60	10.50	10.55	8	
Shen 2	1	10.80	10.95	10.90	10.90	11.80	12.30	12.15	12.10	11	11
	2	10.90	11.00	10.95	11.10	12.25	12.15	12.50	12.25	12	
Shen 7	1	15.70	15.65	15.60	15.75	17.10	16.75	17.15	17.05	9	9
	2	15.70	15.55	16.05	15.65	16.90	17.40	17.30	17.05	9	
Shen 8	1	16.75	16.80	16.70	16.50	17.80	17.60	17.60	17.75	6	6
	2	16.80	16.95	16.90	16.80	17.65	17.80	17.85	17.65	5	
No.		8	8	8	8	8	8	8	8	8	4
Avg.		13.24	13.29	13.30	13.28	14.31	14.38	14.44	14.36	9	9
St.Dev.		3.26	3.23	3.28	3.15	3.33	3.29	3.32	3.30	2.24	2.39
C.V.		24.60%	24.29%	24.66%	23.72%	23.30%	22.89%	22.99%	22.97%	26.25%	28.02%

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Shen 1, Shen 2, Lignin Resin - Face 10%, Core 8%

Shen 7, Lignin Resin - 8%

Shen 8, Lignin Resin - 10%

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 3, 1990
Proj. Ref.: 40602000

Test Material: Shenboard
Nom. Thickness: 11.0 mm / 15.5 mm
Conditioning: 120 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
Shen 1	1	9.60	9.65	9.65	9.65	10.65	10.80	10.85	10.80	12	12
	2	9.70	9.75	9.65	9.90	10.85	10.90	10.80	10.90	11	
Shen 2	1	10.80	10.95	10.90	10.90	12.00	12.70	12.80	12.60	15	16
	2	10.90	11.00	10.95	11.10	12.75	12.60	12.90	12.75	16	
Shen 7	1	15.70	15.65	15.60	15.75	17.75	17.30	18.05	17.60	13	13
	2	15.70	15.55	16.05	15.65	17.90	18.10	17.95	17.60	14	
Shen 8	1	16.75	16.80	16.70	16.50	18.45	18.10	18.05	17.80	8	8
	2	16.80	16.95	16.90	16.80	18.10	18.20	18.05	18.15	7	
No.		8	8	8	8	8	8	8	8	8	4
Avg.		13.24	13.29	13.30	13.28	14.81	14.84	14.93	14.78	12	12
St.Dev.		3.26	3.23	3.28	3.15	3.53	3.38	3.40	3.30	2.98	3.18
C.V.		24.60%	24.29%	24.66%	23.72%	23.86%	22.79%	22.74%	22.32%	24.65%	26.31%

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Shen 1, Shen 2, Lignin Resin - Face 10%, Core 8%

Shen 7, Lignin Resin - 8%

Shen 8, Lignin Resin - 10%

ALBERTA RESEARCH COUNCIL
FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 4,1990
Proj. Ref.: 40602000

Test Material: Shenboard
Nom. Thickness: 11.0 mm / 15.5 mm
Conditioning: 144 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
Shen 1	1	9.60	9.65	9.65	9.65	10.65	10.90	10.90	10.90	12	13
	2	9.70	9.75	9.65	9.90	10.95	11.05	10.90	11.00	13	
Shen 2	1	10.80	10.95	10.90	10.90	12.20	12.90	12.95	12.80	17	17
	2	10.90	11.00	10.95	11.10	12.95	12.80	13.05	13.05	18	
Shen 7	1	15.70	15.65	15.60	15.75	18.10	17.45	18.50	17.95	15	15
	2	15.70	15.55	16.05	15.65	18.00	18.35	18.25	17.95	15	
Shen 8	1	16.75	16.80	16.70	16.50	18.40	18.10	18.20	17.85	9	9
	2	16.80	16.95	16.90	16.80	18.25	18.30	18.25	18.40	9	
No.		8	8	8	8	8	8	8	8	8	4
Avg.		13.24	13.29	13.30	13.28	14.94	14.98	15.13	14.99	13	13
St.Dev.		3.26	3.23	3.28	3.15	3.55	3.37	3.49	3.35	3.49	3.75
C.V.		24.60%	24.29%	24.66%	23.72%	23.75%	22.48%	23.05%	22.35%	26.08%	28.03%

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Shen 1, Shen 2, Lignin Resin - Face 10%, Core 8%

Shen 7, Lignin Resin - 8%

Shen 8, Lignin Resin - 10%

ALBERTA RESEARCH COUNCIL
FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 5, 1990
Proj. Ref.: 40602000

Test Material: Shenboard
Nom. Thickness: 11.0 mm / 15.5 mm
Conditioning: 168 hr. Soak

Panel No.	Sample No.	Dry Thickness Position 1	2	3	4	Wet Thickness Position 1	2	3	4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
Shen 1	1	9.60	9.65	9.65	9.65	10.80	11.10	11.00	11.00	14	14
	2	9.70	9.75	9.65	9.90	11.05	11.15	11.00	11.05	13	
Shen 2	1	10.80	10.95	10.90	10.90	12.35	13.10	12.85	12.90	18	18
	2	10.90	11.00	10.95	11.10	12.95	12.95	13.20	13.20	19	
Shen 7	1	15.70	15.65	15.60	15.75	18.35	17.65	18.75	18.15	16	16
	2	15.70	15.55	16.05	15.65	18.25	18.50	18.35	18.25	17	
Shen 8	1	16.75	16.80	16.70	16.50	18.55	18.30	18.45	18.25	10	10
	2	16.80	16.95	16.90	16.80	18.30	18.50	18.45	18.55	9	
No.		8	8	8	8	8	8	8	8	8	4
Avg.		13.24	13.29	13.30	13.28	15.08	15.16	15.26	15.17	15	15
St.Dev.		3.26	3.23	3.28	3.15	3.58	3.38	3.55	3.44	3.44	3.68
C.V.		24.60%	24.29%	24.66%	23.72%	23.75%	22.31%	23.30%	22.66%	23.65%	25.33%

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Shen 1, Shen 2, Lignin Resin - Face 10%, Core 8%

Shen 7, Lignin Resin - 8%

Shen 8, Lignin Resin - 10%

ALBERTA RESEARCH COUNCIL

FOREST PRODUCTS LABORATORY

Thickness Swell
(CAN3-0437-M85)

Client: A.R.C.
Test Date: February 9, 1990
Proj. Ref.: 40602000

Test Material: Shenboard
Nom. Thickness: 11.0 mm / 15.5 mm
Conditioning: 168 hr. Soak Then Oven Dry

Panel No.	Sample No.	Dry Thickness Position 1	Dry Thickness Position 2	Dry Thickness Position 3	Dry Thickness Position 4	Wet Thickness Position 1	Wet Thickness Position 2	Wet Thickness Position 3	Wet Thickness Position 4	Sample Thick. Swell	Panel Thick. Swell
		mm	mm	mm	mm	mm	mm	mm	mm	%	%
Shen 1	1	9.60	9.65	9.65	9.65	9.85	10.15	9.95	10.00	4	3
	2	9.70	9.75	9.65	9.90	10.05	10.05	10.05	10.05	3	
Shen 2	1	10.80	10.95	10.90	10.90	11.60	11.60	11.65	11.30	6	6
	2	10.90	11.00	10.95	11.10	11.45	11.55	11.85	12.00	7	
Shen 7	1	15.70	15.65	15.60	15.75	16.90	16.35	17.20	16.95	7	7
	2	15.70	15.55	16.05	15.65	16.65	16.90	17.00	16.80	7	
Shen 8	1	16.75	16.80	16.70	16.50	17.10	17.10	17.05	16.80	2	2
	2	16.80	16.95	16.90	16.80	17.05	17.40	17.30	17.45	3	
No.		8	8	8	8	8	8	8	8	8	4
Avg.		13.24	13.29	13.30	13.28	13.83	13.89	14.01	13.92	5	5
St.Dev.		3.26	3.23	3.28	3.15	3.36	3.32	3.41	3.36	2.20	2.36
C.V.		24.60%	24.29%	24.66%	23.72%	24.32%	23.91%	24.37%	24.15%	46.03%	49.21%

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Shen 1, Shen 2, Lignin Resin - Face 10%, Core 8%

Shen 7, Lignin Resin - 8%

Shen 8, Lignin Resin - 10%

ALBERTA RESEARCH COUNCIL
FOREST PRODUCTS LABORATORY