

DC2183/2A

**Testing of A.J. Bates Ltd
'Fenta' Coated Samples**

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Testing of A.J. Bates Ltd 'Fenta' Coated Samples

1. CLIENT

A J Bates Ltd
PO Box 12 073
Penrose
Auckland 1135
New Zealand

2. DESCRIPTION OF MATERIALS TESTED

The client supplied a set of coated fibre cement panels identified as 'Fenta'. These were identified with the BRANZ sample code 12/004.

3. LIMITATION

BRANZ has no knowledge of the sampling criteria used to select the samples submitted for testing, the results only relate to the samples tested.

4. DESCRIPTION OF TEST PROCEDURES

The following tests were carried out:

3.1 Specular Gloss

Specular gloss was measured using a Rhopoint Novogloss gloss meter with a 20°, 60° & 85° coincident head angle. The instrument was calibrated with a reference standard prior to measurements being made. To obtain an accurate gloss measurement, a total of three measurements were made on each control sample; all gloss measurements were taken perpendicular to the machine direction (long direction). Note: Measurement of specular gloss can be sensitive to small differences in the substrate.

3.2 Adhesion

Adhesion was assessed by two methods:

(a) Cross-cut method: ASTM D3359 method B.

(c) Pull-off strength method: ASTM D4541. The test surface and the bottom of the aluminium dollies were lightly abraded using 320 grit carborundum paper, this improved adhesion of the dollies to the test surface using Araldite 2001 adhesive. Four tests were carried out on each of three separate A4 sized samples to give 12 results in total.

3.3 High Humidity Resistance

High humidity resistance was carried out in a Contherm CAT180/190 RHSLT Humidity Chamber operating at 35°C at 95% RH. Three samples were placed in the cabinet at 35°C and 95% RH for 240 hours. The samples were then inspected for defects and tested for pull-off adhesion. Specular gloss at a 20°, 60° & 85° coincident angle in the cross direction was also measured before and after testing.


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3.4 Steam Resistance

Steam resistance testing was completed on the samples by placing the samples over a boiling water-bath for a period of 24 hours, followed by examination of the surface for changes or defects.

3.5 Taber Abrasion Testing

Taber abrasion testing was completed on the samples according to ASTM D4060 "Standard test method for abrasion resistance of organic coatings by the Taber abraser". New CS-17 wheels were used. The weight loss of the samples was measured during abrasion to calculate the Wear Index. The samples were abraded until the substrate was visible or until 6000 cycles were completed. The formula for calculating Wear Index is $I = (A-B) \times 1000 / C$ where A=initial weight (mg), B=final weight (mg) and C=number of cycles completed(thousand).

3.6 Water Resistance

Water resistance at 20°C was assessed by the following method: A PVC tube filled with 200 ml of distilled water was sealed to the sample in contact with the coating surface, and the whole assembly placed in a climate chamber at 20°C at 75% RH for 96 hours. After this time the sample was removed and the coating assessed for defects.

3.7 Cobb Test

The Cobb test was assessed using the ASTM D5795 test standard, 'Determination of Liquid Water Absorption of Coated Hardboard and Other Composite Wood Products Via "Cobb Ring" Apparatus'. A PVC ring with a wall height of 30 mm and internal diameter of 104 mm was sealed to each test specimen with a 'Sika' sealant and allowed to condition for 7 days at $23 \pm 2^\circ\text{C}$ and $50 \pm 5\%$ relative humidity. This sealant was used in preference to butyl or silicone caulk or a clamp and gasket method for sealing the rings to the coated face of each sample. Prior to filling each ring with distilled water to a depth of 13 ± 3 mm each test assembly was weighed to the nearest 0.01 gram and recorded before its exposure time. After 24 hours the water was poured from the ring and the test area blotted completely dry with a soft paper towel; the test assembly was then immediately weighed and the new weight of the test sample and ring recorded. The amount of water absorbed was then calculated using the initial and final weight measurements. Control samples without rings were also weighed to assess the degree of equilibration during the test.

3.8 Scrub Resistance


Scrub resistance testing was performed as described in AS 1580.459.1, with the exception of a gauze pad replacing the hog bristle brush, testing was carried out in the parallel (long) direction. Two samples were tested for 3000 cycles. The surface of each sample was examined before and after testing. Specular gloss at 20°, 60° & 85° in the cross direction was measured before and after testing to detect any changes in the substrate due to scrubbing. The solutions used for each panel were 'Ajax Spray and Wipe 5 in 1 Multipurpose cleaner™' and 'Jif™' cream.

3.9 Colour Change

Test samples were heated in an oven set at 60°C for 7 days then inspected for any colour changes.


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4.0 Dry Film Thickness

Five coating thickness measurements were taken using a DeFelsko Corporation Positector, model 100 series coating thickness gauge. The measurements were averaged when reported.

4.1 Thermal Shock

Heat resistance was completed by placing the samples in a temperature-controlled oven at 100°C for one hour followed by the constant climate room at 20°C for one hour. Ten cycles were carried out. At the completion of the test the surface of each sample was inspected for changes or defects.

4.2 Stain/Chemical Resistance

Stain and Chemical resistance was determined for the samples as described in ASTM D3023 - Determination of Resistance of Factory-Applied Coatings on Wood Products to Stains and Reagents. The chemicals used were *Pams* 'Brite Bleach' – 31.5g/litre sodium hypochlorite, *Clorex N.Z. Ltd* 'Handy Andy®', *Palmolive* 'Spring Sensations®' dish washing liquid, Ethanol 96% v/v, 10% hydrogen peroxide solution, *Colgate Palmolive* 'Ajax Spray and Wipe™ 5 in 1 multipurpose cleaner', *Selleys* 'Oven Kleen'.

4.3 Impact Resistance

Impact resistance was assessed as described in AS 1580.406.1 - Resistance to Impact - Falling Weight Test (Gardner Type Tester). This method tests the effect of deformation of the sample on the adhesion of the coating system applied to the substrate. The samples were subjected to impact from an indenter falling from various heights. The drop height of the indenter was increased until failure of the coating occurred i.e. cracking of coating. The impact resistance (Joules) was then calculated using the maximum height where failure did not occur.


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5. RESULTS

The results for each test are shown in the Tables at the end of the report. For test ratings, refer to section 5.1 Ratings. During testing some observations were recorded, refer to section 5.2 Notes. After completing testing the tested specimens were returned to the client.

5.1 Ratings

P = Passed test (no changes to surface appearance)
M = Marked surface
S = Softened surface
W = Wrinkled surface
B = Bubble

Taber Abrasion Index: Higher number = greater abrasion in less cycles

(<) indicates that the substrate was not abraded after 6000 cycles

Cross cut adhesion ratings 0B = >65% of area removed
1B = 35-65% removed
2B = 15-35% removed
3B = 5-15% removed
4B = <5% removed
5B = 0% removed

5.2 Notes

Staining noted with Ethanol 96% v/v following the ASTM D3023 procedure was found to have disappeared when the sample was re-checked several days later.


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Table 1: Results for Fibre Cement 'Fenta'

Test	Details	Results
Specular Gloss 20°	Average gloss unit (cross dir.)	94.7
	Standard deviation	0.1
	Average gloss unit (machine dir.)	94.97
	Standard deviation	2.9
Specular Gloss 60°	Average gloss unit (cross dir.)	97.4
	Standard deviation	
	Average gloss unit (machine dir.)	97.27
	Standard deviation	0.4
Specular Gloss 85°	Average gloss unit (cross dir.)	94.1
	Standard deviation	1
	Average gloss unit (machine dir.)	97.13
	Standard deviation	0.5
Adhesion	Average cross cut adhesion	5B
	Average pull off adhesion (N)	109.6
	Standard deviation (N)	17.5
	Failure location	substrate
Scrub Resistance 'Spray & Wipe'	Avg. gloss unit 20° before test (cross dir.)	92.1
	Standard deviation	3.4
	Avg. gloss unit 20° after test (cross dir.)	91.2
	Standard deviation	1.0
	Avg. gloss unit 60° before test (cross dir.)	97.6
	Standard deviation	
	Avg. gloss unit 60° after test (cross dir.)	96.0
	Standard deviation	0.4
	Avg. gloss unit 85° before test (cross dir.)	95.1
	Standard deviation	1.5
	Avg. gloss unit 85° after test (cross dir.)	90.9
	Standard deviation	1.1
	Surface defects	
	'Jif' cream	Avg. gloss unit 20° before test (cross dir.)
Standard deviation		0.1
Avg. gloss unit 20° after test (cross dir.)		74.7
Standard deviation		13.1
Avg. gloss unit 60° before test (cross dir.)		97.4
Standard deviation		
Avg. gloss unit 60° after test (cross dir.)		92.6
Standard deviation		0.5
Avg. gloss unit 85° before test (cross dir.)		94.1
Standard deviation		1.0
Avg. gloss unit 85° after test (cross dir.)		85.6
Standard deviation		0.2
Surface defects		


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Table 2: Results for Fibre Cement 'Fenta'

Test	Details	Results
Water Resistance	96 Hours exposure	P
High Humidity Resistance	Average pull off adhesion (N)	131.4
	Standard deviation (N)	27.1
	Failure location	substrate
	Average cross cut adhesion	5B
	Avg. gloss unit 20° before test (cross dir.)	97.2
	Standard deviation	2.1
	Avg. gloss unit 20° after test (cross dir.)	75.1
	Standard deviation	1.0
	Avg. gloss unit 60° before test (cross dir.)	97.4
	Standard deviation	-
	Avg. gloss unit 60° after test (cross dir.)	94.9
	Standard deviation	0.2
	Avg. gloss unit 85° before test (cross dir.)	89.7
	Standard deviation	2.3
	Avg. gloss unit 85° after test (cross dir.)	98.9
	Standard deviation	0.3
Steam Resistance	24 Hours exposure	P
Taber Abrasion Wear Index		< 48
Colour Resistance		P
Cobb Test	Δ weight (g)	0.06
Chemical resistance	Bleach (hypochlorite)	P
	'Handy Andy'	P
	Dishwashing liquid	P
	Ethanol 96%	F – see note in Section 5.2
	10% Hydrogen peroxide	P
	'Spray & Wipe'	P
	Oven cleaner	P
Thermal shock		P
Dry Film Thickness	Average thickness μm	122.8
	Standard deviation	5.9
Impact Resistance	(Joules)	0.51

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