South African Bureau of Standards
Private Bag X191 Pretoria 0001
TEST REPORT
(Private and confidential)

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(Privaat en vertroulik)

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Our ref. : 17/6
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TESTING OF PANELS COATED WITH BENHAMIL

1. REQUEST

Test two sets of coated panels for the following properties:

a) Adhesion, cross-cut; and
b) adhesion, pull-off.

In addition, test the standard set of coated panels only for
a) direct impact;
b) alkali resistance test;
c) acid resistance test;
d) hot water resistance test; and
e) chemical stain resistance test.

2. DETAILS OF SAMPLE

The following panels, coated one side, were submitted:

Sponsor's reference No.	Quantity	Size, mm	Description
Standard Undercoat	14	150 x 70 x 1,5	) Panels coated with
	6	100 x 100 x 1,5	) respective under-
"B" Undercoat	6	150 x 70 x 1,5	) coat and a topcoat
	6	70 x 70 x 1,5	) of "Benhamil"

In addition, a copy of a test report, reference No. 0-15900/CFL of the Singapore Institute of Standards and Industrial Research (SISIR) dated 20 August 1985 was enclosed.

/3. TEST ....

3. TEST METHODS

Property	Method	Description
Adhesion, cross cut	ASTM D3359 A	Two cuts 40 mm long intersecting near their middle at an angle of 30° to 45° were made. The cuts were deep enough to penetrate to the metal. Adhesive tape was firmly applied over the cross cut and after 90 s quickly pulled off at an angle of about 180°
Adhesion, pull off	SABS 1217 Subsection 8.6	Discs of diameter 45 mm were cut from the panels. The discs were attached to steel bobbins using an epoxy adhesive. The bobbins were pulled apart on a tensile testing machine and the breaking force required was recorded
Direct impact	SABS Method 146	The impact tester comprised a cylindrical steel mass piece of 900 g weight with a hardened steel ball of diameter 12,7 mm at the lower end inside a vertical graduated tube. The mass piece was raised to the height to give a specific impact and allowed to fall onto the coated panel
Alkali resitance test	BS 1390	A coated panel was partially immersed in a 10 % solution of sodium carbonate at 18 °C for 20 minutes. The panel was removed and manganese dioxide powder rubbed onto the panel. Any uniform staining indicated that the enamel was not alkali resistant
Acid resistance	BS 1390	A few drops of a 10 % (m/v) solution of citric acid were placed on the coated panel and a watch glass placed on top. The panels were kept at 23 °C and after 15 min the watch glass was removed and the panel washed and dried. The panel was examined visually and, using a HB pencil, lines were drawn. The lines were rubbed out using a towel to see if they were more difficult to remove than on non-treated areas
Hot water test	BS 1390	A panel was partly immersed in boiling water for 2 h . After cooling and drying, the panel was examined for signs of attack
Chemical stain resistance tests	Spot test	These tests were carried out in accordance with the information supplied by the SISIR report. A few drops of each solution was applied to separate parts of the panel and each covered with a watch glass. The panels were left for 16 h at 23 °C, then washed, dried and examined for defects

/4. RESULTS ....

4. RESULTS

Property	Evaluation	
	Standard	"B"
Adhesion, cross cut	5A (No loss of adhesion)	5A (No loss of adhesion)
Adhesion-pull off		
Adhesion, MPa	>16 [1]	3,8 [2]
Break	Topcoat/adhesive	Undercoat cohesive Failure
Direct impact, kg/cm	>150	
Alkali resistance	No staining	
Acid resistance	No defects	
Hot water resistance	No defects	
Chemical resistance		
5 % detergent solution	No staining	
10 % ammonia solution	No staining	
3 % hypochlorite bleach	No staining	

1) This result is greater than the minimum requirement for pipe coatings SABS 1217: Type I.
2) This figure is below the minimum for pipe coatings SABS 1217: Type 1.

5. CONCLUSION

The standard undercoat had significantly better adhesion than the "B" undercoat when tested in accordance with SABS 1217 Subsection 8.6.

The 'Benhamil' topcoat showed no sign of breakdown on any of the resistance tests and had a high impact resistance.

for DIRECTOR GENERAL

WB/CR