RELATÓRIO DE ENSAIO Nº 339/04

SENAI

É o Sistema FIERGS trabalhando para você.

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LABORATÓRIO DE CONTROLE DE QUALIDADE

Recebimento Nº: 339/04

de 27/08/04

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TESTS ON COATINGS

1 - DESCRIPTION AND IDENTIFICATION OF THE SAMPLE:

PET

1.1 – **Sample 01:** PET gloss white, 0.5 mm thick.
1.2 – **Sample 02**: PET texture white, 0.5 mm thick.
1.3 – **Sample 03**: PET Lacan white, 0.5 mm thick.

2 – SAMPLING:

The collecting, sampling and identification were carried out by the client.

3 - PURPOSE OF THE TEST:

Through these tests we intend to evaluate the performance of the samples in compliance with standard NBR 14535.

4 – PREPARATION OF THE SAMPLES:

The condition used for the test was 24 hours at (27 ± 2)°C and relative humidity (50 ± 5)%.

5 - PROCEDURE:

5.1 – COATING RESISTANCE TO DRY HEAT AND MOIST HEAT.
Test carried out in compliance with NBR 14535:2000.
The aluminum test bock is heated at the testing temperature specified by the standard and afterward it is placed on the surface to be tested during twenty minutes. Then, the block is removed from the sample and after 16 to 24 hours an evaluation is made according to the table below. For the moist heat test a piece of cloth with polyamide dampened with 2 ml of distilled water is put between the block and the piece to be tested.

DESCRIPTION OF THE DEFECTS	RANK
No visible marks	5
Little variation in the gloss or small marks barely perceptible	4
Slight visible mark in different directions, for example, disc almost complete, slightly visible.	3
Strong visible mark or region slightly discolored or region slightly affected.	2
Strong visible mark or region distinctly discolored or region strongly affected.	1

5.2 – RESISTANCE TO TEMPERATURE CHANGE (THERMAL CHOCK):
Test carried out in compliance with NBR 14535:2000.
The sample is placed firstly in a stove at 50º C +/- 3º C for 1 hour, then in a freezer at –20º C +/- 1º C. After leaving to rest for 15 minutes, the defects are evaluated.

5.3 – DETERMINATION OF IMPACT RESISTANCE:
A steel sphere is dropped on the panel from 2 meters. After the impact an evaluation is carried out according to the table below:

APPEARANCE OF THE TESTED AREA	RANK
No crack or fissure	5
One or two circular cracks or fissures around the edge of the impact area.	4
Moderate or severe crack or fissure restricted to the impact area and/or slight peeling of the finish film.	3
Crack or fissure going beyond the impact area and/or slight peeling of the finish film.	2
More than 25% of the finish film removed from the impact area.	1

5.4 – DETERMINATION OF GLOSS:

Test carried out in compliance with NBR 14535:2000.
The test equipment used is a Glossmeter, with 60° geometry, with calibration certificate n.º39928/01 (Lab. de Ótica/IPT).

Range (gloss units)	Classification
0 to 10	Dull
11 to 30	Semi-dull
31 to 70	Semi-gloss
71 to 90	Gloss
91 to 100	Specular gloss or high gloss

5.5 – RESISTANCE TO ABRASION:
Test carried out in compliance with NBR 14535:2000.

Test Equipment:
- Abrasion equipment, Model 5130 Taber Abraser;
- Abrading wheel H-18;
- Suction 100;
- 500g load for each arm;
- 200 cycles were carried out for the three specimens of each sample and after that the average wear rate was checked;
The following result was analyzed: wear rate, that is, loss of weight in milligram per cycle (mg/cycle).

5.6 COATING FILM HARDNESS (PENCIL HARDNESS)
The test method is based on standard NBR 14535:2000, which consists of using a set of graded pencils starting with the hardest, as follows:

6H-5H-4H-3H-2H-H-F-HB-B-2B-3B-4B-5B-6B.
← Highest hardness ----- Lowest hardness →

The test result is expressed with the hardest lead that will not scratch the film neither mark it.
Lead manufacturer: Johann Faber

5.7 – RESISTANCE TO HOUSEHOLD CHEMICALS
This test determines the effect of household products in general, on transparent and pigmented organic finish, causing any alteration on the surface, such as discoloration, change in gloss, blister formation, softening, creasing, adhesion loss and others.

The chemical products used are listed in the results.
Approximately 5ml of reagent was put in contact with the surface being tested, which remained uncovered.
After 16 hours, the reagent was removed in compliance with the procedures described below. After each procedure, dry with a soft dry white piece of cloth leaving it to dry for an hour before analysis. In case the stain remains, continue the procedures.

1. Rub a cloth damped with water.
2. Rub a cloth damped with water and neutral soap.
3. Rub a cloth damped with hydrated alcohol and water solution. Remove it with a cloth damped in water.
4. Rub a cloth damped with hydrated alcohol. Remove with a cloth damped in water.
5. Apply neutral household detergent. Remove it with a cloth damped in water
6. Apply household cleanser (Aguarras/Ajax was used), slightly rubbing it. Remove it with a cloth damped in water
7. Apply bleacher. Remove it with a cloth damped in water
8. Apply liquid saponaceous product, slightly rubbing it. Remove it with a cloth damped in water

Products that leave permanent visible marks after the removal procedure are considered blotchy products.

6 – RESULTS:

Tests carried out from 26/08/04 to 24/09/04.

6.1 – RESISTANCE TO DRY HEAT:

TEMPERATURE	SAMPLE 01	SAMPLE 02	SAMPLE 03
70° C	5	5	5
85° C	3	4	4

Classification according to 14535:
> or = 4 → High protection
= 3 → Medium protection
< 3 → Low protection

6.2 – RESISTANCE TO MOIST HEAT:

TEMPERATURE	SAMPLE 01	SAMPLE 02	SAMPLE 03
70° C	5	5	5
85° C	3	4	3
100° C	1	1	1

Classification according to NBR 14535:
> or = 4 → High protection
> or = 3 → Medium protection
> or = 2 → Low protection

6.3 – RESISTANCE TO IMPACT:

SAMPLE	RANK
01	5
02	5
03	5

Classification according to NBR 14535:
> or = 5 → High protection
> or = 4 → Medium protection
> or = 3 → Low protection

6.4 – RESISTANCE TO SUDDEN TEMPERATURE CHANGE (THERMAL CHOCK):

	RESULT
SAMPLE 01	**30 CYCLES**
SAMPLE 02	**30 CYCLES**
SAMPLE 03	**30 CYCLES**

Classification according to NBR 14535:

> or = 30 cycles → High protection
> or = 20 cycles → Medium protection
> or = 10 cycles → Low protection

6.5 – DETERMINATION OF GLOSS:

SAMPLE	RANGE
01	86,6
02	6,5
03	22,3

6.6 – ABRASION RESISTANCE:

SAMPLE	WEAR RATE (mg/cycle)
01	0,0705
02	0,0857
03	0,0755

NOTE: The Brazilian standard for school furniture specifies a maximum wear rate of 1 mg/cycle for table tops.

6.7 – COATING FILM HARDNESS (PENCIL HARDNESS):

SAMPLE	RESULTS	
	"WRITES" *	"MARKS" **
01	HB	F
02	F	H
03	F	H

NOTE: * Writes – pencil that does not mark nor scratch the coating.
** Marks– pencil that scratches the coating.

Classification according to NBR14535:
Higher than 2H → High Protection
Between F and 2H → Medium Protection
Between 6B and B → Low Protection

6.3 – RESISTANCE TO HOUSEHOLD CHEMICALS:

HOUSEHOLD PRODUCT		RESULTS OF THE CLEANING PROCEDURES	
		Sample 01	Sample 02
1	Water	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
2	Household detergent solution (5%)	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
3	Kitchen oil	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
4	Hot coffee	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
5	Hot tea	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
6	Milk	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
7	Grape vinegar	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
8	Grape juice	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
9	Alcohol	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
10	Household liquid ammonia	Stain reagent removed at the first cleaning	Stain reagent removed at the fourth cleaning
11	Ketchup	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
12	Red lipstick	Stain reagent removed at the eighth cleaning	Stain reagent removed at the eighth cleaning
13	Black wax pencil	Stain reagent removed at the second cleaning	Stain reagent removed at the sixth cleaning
14	Black shoe wax polish (liquid)	Stain reagent removed at the second cleaning	Stain reagent removed at the seventh cleaning
15	Gas	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
16	Amyl Acetate	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
17	Acetone	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
18	Mustard	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
19	Household soap solution (5%)	Stain reagent removed at the first cleaning	Stain reagent removed at the first cleaning
20	Hair dye solution	Stain reagent removed at the eighth cleaning	Stain reagent removed at the eighth cleaning
21	Blue ballpoint pen ink	Stained	Stained
22	Black felt pen ink (solvent based)	Stain reagent removed at the fourth cleaning	Stain reagent removed at the sixth cleaning

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HOUSEHOLD PRODUCT		RESULTS OF THE CLEANING PROCEDURES
		Sample 03
1	Water	Stain reagent removed at the first cleaning
2	Household detergent solution (5%)	Stain reagent removed at the first cleaning
3	Kitchen oil	Stain reagent removed at the first cleaning
4	Hot coffee	Stain reagent removed at the first cleaning
5	Hot tea	Stain reagent removed at the first cleaning
6	Milk	Stain reagent removed at the first cleaning
7	Grape vinegar	Stain reagent removed at the first cleaning
8	Grape juice	Stain reagent removed at the first cleaning
9	Alcohol	Stain reagent removed at the first cleaning
10	Household liquid ammonia	Stain reagent removed at the fourth cleaning
11	Ketchup	Stain reagent removed at the first cleaning
12	Red lipstick	Stain reagent removed at the eighth cleaning
13	Black wax pencil	Stain reagent removed at the sixth cleaning
14	Black shoe wax polish (liquid)	Stain reagent removed at the seventh cleaning
15	Gas	Stain reagent removed at the first cleaning
16	Amyl Acetate	Stain reagent removed at the first cleaning
17	Acetone	Stain reagent removed at the first cleaning
18	Mustard	Stain reagent removed at the first cleaning
19	Household soap solution (5%)	Stain reagent removed at the first cleaning
20	Hair dye solution	Stain reagent removed at the eighth cleaning
21	Blue ballpoint pen ink	Stained
22	Black felt pen ink (solvent based)	Stain reagent removed at the sixth cleaning

Classification according to NBR 14535:
Resist to at least 21 products → High Protection
Resist to at least 14 products → Medium Protection
Resist to at least 8 products → Low Protection

NOTE:

1. **THE RESULTS ARE ONLY VALID FOR THE SAMPLE CONDITIONS AT THE MOMENT OF THE TEST.**
2. **THIS REPORT CANCELS AND REPLACES REPORT N° 257/04 FROM 24/09/2004.**

Bento Gonçalves, 14 October 2004.

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