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FOREIGN TECHNOLOGY DIVISION

PAINTS AND VARNISHES. METHODS FOR DETERMINING ADHESION

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EDITED TRANSLATION

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PAINTS AND VARNISHES. METHODS FOR DETERMINING ADHESION

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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliterati
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yë or ë.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

GOST 15140-69

Paints and Varnishes. Methods for determining adhesion.

This standard is applied to paints and varnishes and establishes methods for determining adhesion of paint and varnish coverings to metal surfaces: layering method (quantitative method); method of lattice-like cuts and the method of parallel cuts (quantitative method).

The use of these methods is envisioned in standards and in technical conditions for production and establishes the technical requirements for it.

This standard corresponds to the recommendation according to standardization of SEV RS 2094-69 in the part of determining the adhesion by the method of lattice-like cuts and the method of parallel cuts.

1. Layering method.

1.1. The essence of the method consists of determining the adhesion by means of layering a flexible base fr m a film reinforced with fiber glass fabric and measurement of the force necessary for this.

1.2. Equipment and materials:

tensile-testing machine with maximum load of 3 kgf which permits making a calculation with an accuracy of up to 1 gf;

a device for maintaining a constant angle of layering (see diagram) is fastened to the lower clamp of the tensile-testing machine;

micrometer according to GOST 6507-60 or GOST 11195-65;

foil, soft M and rolled for the technical goals according to GOST 618-62 of aluminum (GOST 4784-65) of brands AD1 and AD;

rolled foil for technical goals according to GOST 5638-51, with a thickness of 0.05 mm of copper according to GOST 859-66 - brands M0, M1, M2;

sheet foil according to GOST 1327-47 with a thickness of 0.05 mm, of tin according to GOST 860-60 not lower than brand 02;

fiber glass fabric according to GOST 8481-61 with a thickness of 0.04-0.06 mm;

metal gage or template for cutting of bands;

shaving edges or scissors;

soft flat brush (columnar);

plates of photoglass with dimensions 90x120 mm according to GOST 683-52.

1.3. Preparation for testing.

1.3.1. The foil is stretched onto the glass plate, smoothed out and scoured with a cotton pad moistened with acetone. Copper foil is only used for paints and varnishes whose drying occurs at a temperature lower than 180°C.

The copper foil, before being used, is polished with GOI paste for eliminating the oxide layer.

1.3.2. The paint and varnishing material must be thinned and applied to foil by any method and dried. Then a second layer is applied, on which we immediately apply fiber glass fabric moistened with acetone and dried; then it is tightly compressed to the foil. Then the paint (varnish) is applied with a brush to the fiberglass fabric, fully wetting it. The sample is dried, removed from the plate, and cut into 10 bands with dimensions 10x60 mm each. The outer bands thrown away, and on the remaining bands the foil is peeled off from

film with fiberglass fabric to a length which somewhat exceeds half the total length of the band (approximately 35 mm) and is bent 180°. The thickness of the film with fiberglass fabric must be 70-100 μm.

1.3.3. Before determining adhesion, if the periods of delay of the covering after drying are not specified in the corresponding technical requirements, the samples of coverings of cold drying are kept at 20±2°C and relative humidity of 65±5% for 48 hours, and samples of coverings of hot drying - not less than 3 hours.

1.3.4. Before determining adhesion, we measure the thickness of the film on not less than 2 parts of the surface of the tested sample; here, the divergence in thickness of film must not exceed 5 μm.

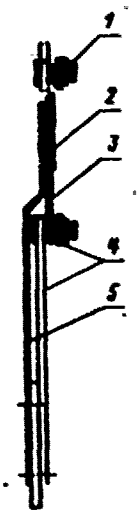

Diagram of the device for maintaining constant angle of layering. 1 - upper clamp; 2 - foil; 3 - film of varnish (enamel) reinforced with fiberglass fabric; 4 - lower clamp; 5 - guide plate.

1.4. Conducting the test.

1.4.1. Test was conducted at 20±2°C and relative humidity of the air 65±5%.

1.4.2. The band acquired according to paragraph 1.3.2 is fastened to the tensile-testing machine so that the film with fiberglass fabric is clamped in the upper clamp 1, and the foil - in the clamp

of the device (see diagram). Part of the unlayered sample must be pressed to the guide plate.

1.4.3. The sample is layered at a speed of movement of the clamp of the device of 6.5-7 cm/min and an angle of layering of 180°.

1.4.4. The adhesion value in gf/cm is considered as the mean arithmetic of eight determinations.

Discrepancies in the results of parallel samples must not exceed 10%.

2. Method of lattice-like cuts and the method of parallel cut.

2.1. Equipment and materials:

shaving blades with a thickness of 0.1-0.13 mm in a special container or scalpel;

a metal gage or template with cuts at a specific distance from one another for applying parallel cuts on the coverings;

metal plates with dimensions 70x150 mm;

a flat soft brush (columnar);

magnetic thickness gage;

adhesive polyethylene tape (adhesiveness 80-120 sec) - only for the parallel cut method.

Adhesiveness of the tape is checked by measuring the time necessary for removing the band of tape with a length of 100 mm and a width of 10 mm from the glass plate in a vertical position with the aid of a load of 200 gf fastened to the lower part of the tape.

2.2. Preparation for the test

2.2.1. The surface of the metal is carefully cleaned of rust, scales, and other impurities and scoured. On the finished surface,

we apply the tested paint or varnish.

2.2.2. The selection of the painted surface (base), its preparation, application of the paint or varnish directly on the base or in a complex combination, with consideration of the amount of layers to be applied, the thickness of the tape, and the drying time are conducted in connection with the standards or technical conditions for the material being tested.

2.2.3. Adhesion is determined after holding the covering as per paragraph 1.3.3 and measuring the thickness as per paragraph 1.3.4.

2.2.4. Test is made at 20±2°C and relative humidity of the air 65±5%. Determination is done on not less than two samples (parallel) and on not less than 3 parts of the surface of each sample tested.

2.2.5. Before testing each new sample of paint and varnish covering, the shaving blades are replaced, and the scalpel is sharpened.

2.3. Conducting and evaluating the results of tests.

2.3.1. With determination of adhesion by the method of lattice-like cuts, we make, on the tested covering, not less than five parallel cuts up to the base with the shaving edge or scaplel along the gage or template at a distance of 1-2 mm from one another and as many similar cuts (perpendicular) as on the first. As a result, there forms on the covering a standard lattice of squares with identical dimensions: 1x1 mm - for coverings with a thickness of less than 60 μm or 2x2 mm - for coverings with a thickness of more than 60 μm.

The surface of the covering, after applying the lattice, is cleaned of layered pieces of film and the adhesion of the covering is evaluated on a four-ball scale (table 1).

Table 1.

Ball #	Description of surface of paint after applying lattice-like cuts
1	The edge of the cuts must be smooth and there must not be residual pieces of covering.
2	Insignificant layering of the covering in the form of points along the line of cuts or in the areas of their intersection (up to 5% of the surface with each lattice).
3	Layering of the covering along the cut line or bands (up to 35% of the surface with each lattice.
4	Full or partial layering of the covering with bands or squares along the cut line (more than 35% of the surface of each lattice).

2.3.2. For coverings which are highly adhesive (ball 1 according to the method of lattice-like cuts), we can more accurately ascertain ahesion by the method of parallel cuts with the use of adhesive tape.

We make, on the coverings, not less than five parallel cuts to the base with a shaving edge or a scalpel along the gage or template at a distance of 1 mm from one another. Perpendicular to the cuts, we apply a strip of adhesive polyethylene tape with dimensions 10x100 mm, leaving one end of the strip untaped.

The tape is rapidly removed perpendicularly from the covering.

Adhesion, according to the method of parallel cuts, is evaluated on a 3-ball scale (table 2).

Table 2.

Ball #	Description of surface of paint after applying parallel cuts and removing adhesive tape.
1_1	Edge of cuts smooth.
1_2	Insignificant layering of the civering along the width of the band along the cuts (no more than 0.5 mm)
1_3	Layering of the covering with entire bands.

Formulating the results of tests.

3.1. Results of the tests are published in a journal or formulated with protocol, in which must be indicated:

a) system of covering;

b) technology of application of coverings;

c) drying conditions;

d) time interval from moment of applying covering until the beginning of its testing;

e) thickness of covering;

f) base and its preparation;

g) type and size of cuts;

h) evaluation of adhesion;

i) number of the present standard.

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