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No One Knows Shellac Like We Do!

Hardness and Chemical Resistance Testing for *Royal-Lac*[®]

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INTRODUCTION:

Hardness and chemical resistivity are very important features for a coating. Acting as a barrier between the environment and a substrate, a coating needs to exhibit good resistivity for the protection of the substrate.

The challenges faced by a coating formulator is to develop a coating that has exceptional adhesive qualities along with characteristics like flexibility, durability, scratch and chemical resistance.

Royal-Lac[®] is the only shellac-based finish that performs well in terms of protection and durability.

This document discusses the tests used for ascertaining hardness and chemical resistivity.

Final test results for *Royal-Lac*[®] are included.

This document will not discuss standard test procedures employed for obtaining the results.



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HARDNESS TESTING:

This document will cover two forms of hardness testing that were conducted on wood samples coated with *Royal-Lac*[®].

- 1) Pencil Hardness Test
- 2) Koenig Hardness Test

PENCIL HARDNESS TEST:



Pencil Hardness Tester

A Pencil Hardness Gauge is used to determine the hardness of an organic coating. The results are recorded as the rating of hardest pencil that does not scratch or mar the surface of the coating.

The Pencil Hardness Test Gauge is equipped with 8 leads located in the following standard positions

Position	1	2	3	4	5	6	7	8
Hardness	2B	B	HB	F	H	2H	3H	4H
	Softest ←						→ Hardest	



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The difference between two adjacent leads is considered one unit of hardness. Testing starts from the hardest and moves to the softest lead.

Pencil Hardness for Common Coatings

Urethane/nitrocellulose lacquer:	F
Water reducible lacquer:	2H
Water-based polyurethane wipe-on finish:	HB-F
Orange shellac 1 lb. cut:	3B

KOENIG PENDULUM HARDNESS TEST:



Koenig Pendulum Tester

The Koenig pendulum hardness test is based on the principle that the amplitude of the pendulum's oscillation will decrease more quickly when supported on a softer surface.

There are several hardness tests which relate the damping of an oscillation motion to hardness of surfaces.



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The essential part of this apparatus is the pendulum. The Koenig pendulum is triangular with an adjustable counterpoise. The assembly swings supported on two ball bearings of 5mm diameter which rest on the test surface.

The counterpoise is used to adjust the period of oscillation to the Koenig standard of 1.4 seconds.

The hardness of any given coating is given by the number of oscillations made by the pendulum within the specified limits of amplitude. A photo-sensor is accurately positioned to register swings of the pendulum. The signals from the photo-sensor are registered by an automatic electronic counter, and the result of a test is shown on the digital display.

CHEMICAL RESISTANCE TEST:



MEK Rub Tester

Solvents, specifically Methyl Ethyl Ketone (MEK), are often used to measure the level of cure of coating systems. Testing involves rubbing the surface of a film with cheesecloth soaked with MEK until failure or breakthrough of the film occurs. The type of cheesecloth, stroke distance, stroke rate, and approximate applied pressure are specified. A double rub constitutes as one rub forward and one rub backward.



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In the coating industry the dominant coating technology is a "thermoset" or "thermosetting" system. In such a system, one or more backbone resins react with a cross-linker resin during the curing process. Developing an appropriate degree of crosslinking is critical to achieving the desired physical, moisture resistance and exterior durability properties of the coating. As the coating is transformed from a liquid state to a solid coating, it is necessary to measure the degree of crosslinking to ensure the coating system has been cured.

The basis for the solvent resistance test method is the fact that as a coating crosslinks it becomes more insoluble. The most commonly used test method is ASTM D 5402-06, "Standard Practice for Assessing the Solvent Resistance of Organic Coatings *Using Solvent Rubs*",

TEST SAMPLE:

A single test sample was used for testing hardness and chemical resistance of *Royal-Lac*[®]. The test sample consisted of a piece of Walnut wood measuring 6" x 3" x 3/8".

The sample was flat sanded to 320 grit and 5 coats of *Royal-Lac*[®] was applied with a pad made from cheesecloth inner and linen outer. Care was taken to keep the finish as level and uniform as possible. Sample was cured for 60 days.



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TEST RESULTS:

Royal-Lac[®] Hardness and Chemical Test Results

Sample 1	Koenig Hardness	Pencil Hardness	MEK Double Rubs
First test	74	H	>200
Second test	79	H	>200
Third test	79	H	>200
Average	77	H	>200

CONCLUSION:

These results demonstrate that *Royal-Lac*[®] offers outstanding resistance to chemical and solvent exposure and performs as well or better than other finishes in its class for all tests conducted.