

MAPLE FLOORING MANUFACTURERS ASSOCIATION

SPECIFICATIONS FOR GYMNASIUM FINISHES AND SEALERS FOR MAPLE, BEECH AND BIRCH FLOORS

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Association

INTRODUCTION

The Association publishes this specification and lists products that conform to it for the sole purpose of providing guidance in efforts to achieve the highest protection and most enduring beauty in wood floors. The Association's activity in this respect involves no responsibility on its part for product performance or casualty.

1.0 General Requirements

- 1.1 All materials submitted for approval must meet the following general requirements, regardless of chemical composition. All materials must also meet the specific requirements of the appropriate category. The categories or Groups are based on product use such as sealer and surface finish.
- 1.2 All materials must be suitable for application to new maple, beech and birch flooring or to in-service flooring that has been suitably prepared.
- 1.3 The material shall be reasonably free from toxicity and objectionable odors. The container labeling must be in accordance with Federal Regulations governing the handling of hazardous materials.
- 1.4 All materials shall meet local requirements with respect to point of manufacture and market to ensure the control of photo-chemically reactive aromatics. The submitter shall supply information showing compliance by listing their solvent systems on the product label. The submitter shall supply information or a label showing compliance with government regulations.
- 1.5 The submitter is required to certify, on a provided form, the chemical category of the product and under which Group it is to be evaluated.

1.0 General Requirements Cont'd.

- 1.6 The submitting party shall agree to provide any specialized products that are deemed necessary to the application of the coating under evaluation, e.g., cleaners, solvents, line-marking paint, applicators.
- 1.7 In the case of urethane resin based products, the submitter is required to provide the percentage of free nitrogen compounds and free isocyanate compounds based on solid's content.
- 1.8 The submitter must be the sole manufacturer of the product that is to be evaluated for compliance.

2.0 Group Requirements

2.1 Group 1, Sealers

Group 1 Oil-based sealers shall include all solvent-based materials of low to intermediate solids content that will also provide adequate surface penetration and slight surface build.

Group 1 Water-based sealers shall contain no significant amount of solvent within their chemical composition and also provide adequate surface penetration and slight surface build.

2.2 Group 2, Low Gloss Oil-Based Gymnasium Type (Surface) Finishes

These materials shall possess a higher solids content that will provide good surface build. These products should yield low gloss characteristics with multiple coats.

2.3 Group 3, High Gloss Oil-Based Gymnasium Type (Surface) Finishes

These materials shall possess a higher solids content that will provide good surface build. These products should yield high gloss characteristics with multiple coats.

2.4 Group 4, Low Gloss Water Based Finishes

These materials shall contain no significant amount of solvent within their chemical composition. These products should yield low gloss characteristics with multiple coats. These products must meet additional specific requirements that are not applicable to Groups 1 through 3.

2.5 Group 5, High Gloss Water-Based Finishes

These materials shall contain no significant amount of solvent within their chemical composition. These products should yield high gloss characteristics with multiple coats. These products must meet additional specific requirements that are not applicable to Groups 1 through 4.

3.0 Preparation of Test Surfaces

3.1 Glass Surfaces

When the procedure refers to this section, the glass test panels shall be prepared as follows:

The glass will be cleaned by repetitive washings with acetone and dried. Flow coat the sample onto the glass and hold it vertically for one minute then place in a horizontal position. Allow the coated panel to dry in moderately moving air maintained at $25 \pm 3^{\circ}\text{C}$ ($77 \pm 5^{\circ}\text{F}$) and $50 \pm 5\%$ relative humidity for 24 hours.

3.2 Wood Surfaces

When the procedure refers to this section, the wood panels shall be prepared in accordance with the coating manufacturer's written or verbal instructions. These instructions may also be found on the product labeling/literature when applicable. In absence of such instruction, the application of the coating shall be performed as follows.

The surface shall be sanded until smooth and uniform and all dust shall be removed. The coating will be applied using a foam, bristle brush or wire wound draw down bar at a rate of 500-600 feet²/gallon. Lap marks, puddling and contamination by airborne particles shall be avoided. The coating will be permitted to cure for 16-24 hours at $25 \pm 3^{\circ}\text{C}$ ($77 \pm 5^{\circ}\text{F}$) and $50 \pm 5\%$ relative humidity. This procedure shall be repeated, with (2) light sandings between coats (3 coats total). Assessment of the surface build will be done. Adequate surface build shall be defined as when the coating permits no interference by the wood substrate, i.e., it covers raised grain and joint lines. Curing time of the final coat shall be 7 days unless otherwise dictated by the test procedure.

4.0 Specific Requirements and Test Procedures

4.1 Non-Volatile Content

Group 1:	Oil Based	25%-45%
	Water Based	> 20% (with catalyst or crosslinker, if applicable).
Groups 2-3:		30%-65%
Group 4:		> 20% (with catalyst or crosslinker, if applicable).
Group 5:		> 20% (with catalyst or crosslinker, if applicable).

Test Procedure

Method: ASTM D 2369

Three aluminum pans will be used to determine the non-volatile content. Samples of approximately 0.5 g of coating per pan will be added followed by 3 ml of a volatile solvent compatible with the coating. The solution will be stirred with a paper clip and then placed in the oven at 110 degrees centigrade for 60 minutes. After cooling the pans will be re-weighed in accordance with ASTM D2369 and the percent non-volatile recorded as an average of the three determinations.

4.2 Flash Point

Group 1:	Oil Based	$\geq 37.8^{\circ}\text{C}$ (100°F)
	Water Based	None when heated to 93.3°C (200°F)
Groups 2-3:		$\geq 37.8^{\circ}\text{C}$ (100°F)
Group 4:		None when heated to 93.3°C (200°F).
Group 5:		None when heated to 93.3°C (200°F).

Test Procedure For Groups 1(oil Based), 3 and 4

Method: ASTM D 56; Tag Closed-Cup Tester

To the oil cup of the Tag Closed-Cup Tester is added 50 ml based upon the density of the coating (coating will be weighed into the cup). The cup is cooled to 10°C (20°F) below the flash point given on the MSDS of the coating as supplied by the manufacturer. The test flame is then ignited and the sample is then heated electrically at 1°C (2°F) per minute. The test flame is then introduced to the vapor space every 0.5°C (1°F). The temperature at which the test flame causes a distinct flash to occur shall be recorded as the flash point of the sample.

4.0 Specific Requirements and Test Procedures Cont'd.

Test Procedure For Groups 1 (water-based), 4 & 5

Method: ASTM D 1310; Tag Open-Cup Apparatus

Fill the test cup with sample to a level approximately 1/8 inch below the edge. The cup and sample are cooled to 10°C (20°F) below the flash point given on the MSDS of the coating as supplied by the manufacturer. The flame is ignited and the sample is heated electrically at 1°C (2°F) per minute. The test flame is then introduced to the vapor space above the sample every 1°C (2°F). The temperature at which the test flame causes a distinct flash to occur or when the temperature of the sample exceeds 93.3°C (200°F) shall be recorded.

4.3 Gloss

Group 1:	Not applicable
Group 2:	Semi Gloss – Range 35-55; Satin – Range 25-35
Group 3:	≥ 90
Group 4:	Semi Gloss – Range 35-55; Satin – Range 25-35
Group 5:	≥ 85

Test Procedure

Method: ASTM D 523

Using a 60° Gloss meter, calibrate the meter on the black standard glass. Flow the finish onto the glass in accordance with 3.1. Obtain and record a gloss reading on the coated glass.

4.4 Package Stability

All Groups shall be free from sediment and suspended solid matter. They shall provide a film that is clear, glossy and free of specks. Water borne coatings shall be free from corrosion products around the rim of the container.

Test Procedure

Method: No. 4261, Federal Test Method Standard No. 141

Thoroughly mix the sample and fill two Gardner viscosity tubes to within 1 inch from the top and stopper. Allow the tubes to stand at ambient conditions for 24 hours and inspect for sediment or suspended matter. If no irregularities are evident, shake one tube vigorously and compare the tubes. Note any differences and record.

Flow coat one glass panel and allow to dry in a vertical position. When dry, observe the film for clarity, gloss and freedom from foreign matter.

Place one of the viscosity tubes prepared above in a 52 +/- 2°C (125 +/- 4°F) oven for 48 hours. Note that the test shall be performed on the polymer portion of the material without the cross-linking additive, when applicable.

4.0 Specific Requirements and Test Procedures Cont'd.

4.5 Dry Time

All Groups shall dry hard in less than 48 hours. Groups 2-3 shall set to touch in not less than one hour or more than three hours. Groups 4-5 shall set to touch in no more than three hours. All Groups shall show no evidence of tackiness and have good drying properties.

Test Procedure

Method: ASTM D 1640; Set-to-Touch and Drying Time

Apply the sample onto a clean glass panel using an appropriate draw down bar to produce between 1 and 1.25 mil dry film. Allow the panel to dry horizontally in a well ventilated area at $25 \pm 3^{\circ}\text{C}$ ($77 \pm 5^{\circ}\text{F}$) and $50 \pm 5\%$ relative humidity. Periodically touch the test film with the tip of a clean finger and immediately rub the fingertip against a piece of clean, clear glass. Observe if any of the coating has transferred to the glass. The film is considered to have set-to-touch when it still exhibits a tacky condition, but none of it adheres to the finger allowing transfer to the glass. The sample has dried hard when the downward pressure exerted between the thumb and the forefinger does not move the film and no marks are visible when lightly polished with a clean, dry piece of terry cloth.

Flow coat a glass panel as directed in 3.1. Place a piece of aluminum foil over the coated surface and a 500 g weight on top of the foil. After 5 seconds, remove the weight. The sample is considered to be free from tackiness if the foil can be easily removed from the coated panel. Repeat as needed to determine the time required to reach this state.

Flow coat a glass panel as directed in 3.1. Rub the coating in a light circular motion using a clean, dry piece of terry cloth. The coating must spread easily and smoothly without excessive tackiness or adhesion between the cloth and coated panel.

Transfer one pint of the sample to a friction lidded jar. Place the filled jar in an $52 \pm 2^{\circ}\text{C}$ ($125 \pm 4^{\circ}\text{F}$) oven for 7 days. Determine the drying properties as above.

4.7 Sanding Properties

All Groups shall possess good sanding properties and not gum or roll when subjected to sanding.

Test Procedure

Prepare a maple strip as directed in 3.2, allowing the final coat to cure for 48 hours at $25 \pm 3^{\circ}\text{C}$ ($77 \pm 5^{\circ}\text{F}$) and $50 \pm 5\%$ relative humidity. Rub the coated surface with a 100-grit screening disc and note whether the coating gums, rolls or pulls.

4.0 Specific Requirements and Test Procedures Cont'd.

4.8 Hardness (Sward Hardness Rocker)

Method: ASTM D 2134

Apply the sample onto a clean glass panel using an appropriate draw down bar to produce between 1 and 2 mil dry film. Allow the panel to dry horizontally in a well ventilated area at 25 +/- 3°C (77 +/-5°F) and 50+/-5% relative humidity for 7 days. The Sward rocker test will then be performed. Care must be taken to insure no surface defects are present which will alter the results.

Place the Sward Hardness Rocker perpendicular to the draw down direction of the coating and tip the tester so that the bubble in the left tube slightly overlaps the mark. Release the tester and when the left bubble just fails to reach the mark, start counting the number of times the bubble in the right tube crosses the mark (beginning with one). Stop the count when the bubble in the right tube just fails to reach the mark.

The hardness value is determined by multiplying the number of oscillations by a factor of two.

All groups must exhibit a minimum hardness of 25.

4.9 Abrasion Resistance

Method: ASTM D 4060

Apply the coating to a clean steel Taber panel with an appropriate wire wound draw down bar to produce a dry film of 1-2 mil. Allow it to dry for 24 hours and lightly sand. Recoat the panel with a second coating of the same thickness resulting in approximately 2-4 mil thickness. Allow the panel to dry for 7 days before testing. A CS-17 wheel with a total arm weight of 1000 grams from Taber. Measure the change in weight loss per 100 cycles. Three panels will be used and averaged.

All groups must exhibit a weight loss of less than 50mg/100 cycles.

4.10A Black Heel Mark Resistance (Option of 2 Test Procedures)

Groups 2 through 5 must give a minimum excellent rating.

Test Procedure Option #1

Prepare an 8x8 inch glass plate by coating the cleaned glass with a 4 mil Bird bar. Allow the coating to dry for 7 days at 25 +/- 3°C (77 +/-5°F) and 50+/-5% relative humidity. Place and secure the panel under the Taber Linear Abraser. Set the 0.25" diameter 40 Durometer rubber tip on the panel with a load of 350 grams and a stroke of 4 inches with a cycle speed of 2 cycles per minute for 2-1/2 minutes or 5 cycles. The test will be repeated three times on the same panel to allow for averaging of results. The percentage of marked surface will be evaluated.

4.0 Specific Requirements and Test Procedures Cont'd.

4.10A Black Heel Mark Resistance (Option of 2 Test Procedures) Continued

The rating system is below.

Excellent:	1% +/- 0.5%
Good:	2% +/- 0.5%
Fair:	7% +/- 1.5%
Poor:	16% +/- 1.5%

Area measurements will be accomplished by placing a white sheet of paper behind the clear glass panel and digitally scanning the panel into a computer. The black marked area will be defined by setting a black threshold value to the gray scale. The set area which the rubber contacts will be fixed and a percentage calculated based on the number of black pixels counted versus the number of pixels possible.

Test Procedure Option #2

Prepare a 9 x 9 inch maple panel as described in 3.2. Place the panel into the Snell Accelerated Soiling Capsule with the prepared side down. Start Capsule rotation at 50 RPM for 2½ minutes in each direction. Remove the panel and place onto it an 8 x 8 inch transparent grid overlay with 10 divisions/inch. Evaluate sample performance by determining the percentage of the panel surface area that is covered by black rubber marks.

Ratings correspond to the following ranges of blackened surface area:

Excellent:	0.7 ± 0.34%
Fair:	6.8 ± 1.47%
Good:	2.2 ± 0.68%
Poor:	16.6 ± 1.59%.

4.11 Adhesion

All Groups shall provide good adhesion properties when re-coated within 24 hours. Group 1 shall also provide good adhesion when coated with a specified top coat other than itself. Good adhesion is equal to a minimum classification of 4B.

Test Procedure

Method: ASTM D 3359

Prepare a strip of maple flooring as described in section 3.2. Using a sharp razor edge blade, make a series of ten parallel cuts that are separated by 1/8 inch and are approximately 1 inch long. Then make a series of ten perpendicular cuts 1/8 inch apart. Place a strip of ¾ inch Permacel #99 adhesion test tape over the scribes and press firmly. The tape is then removed after 60 seconds and rated in accordance with ASTM D 3359.

4.0 Specific Requirements and Test Procedures Cont'd.

4.13 Stain Resistance

Testing Method ASTM D 1308

Group 1: Not applicable

Groups 2-5: Staining material: Distilled Water, 1% Spic&Span solution, Vegetable Oil

Prepare a maple strip as directed in 3.2. A 1-2 inch diameter pool of the staining liquid will be allowed to stand on the surface at 25 degrees centigrade for 4 hours under a watch glass. The watch glass will then be removed and the coating rinsed with water and allowed to dry for 60 minutes. Evaluation for any objectionable alteration of the surface, such as discoloration, change in gloss, blistering, softening, swelling, or loss of adhesion will indicate failure.

4.14 Alcohol, Naphtha, Beer and Cola Resistance

Testing Method ASTM D 1308

Group 1: Not applicable

Groups 2-5: Staining material: 50% alcohol/water solution, Naphtha, Beer (Budweiser) and Coca-Cola.

Prepare a maple strip as directed in 3.2. A 1-2 inch diameter pool of the staining liquid will be allowed to stand on the surface at 25 degrees centigrade for 1 hour under a watch glass. The watch glass will then be removed and the coating rinsed with water and allowed to dry for 60 minutes. Evaluation for any objectionable alteration of the surface, such as discoloration, change in gloss, blistering, softening, swelling, or loss of adhesion will indicate failure. Staining materials will include naphtha, 50%/50% alcohol/water, beer (Budweiser) and Coca-Cola.

4.0 Specific Requirements and Test Procedures Cont'd.

4.15 Perspiration Resistance

Groups 2 through 5 shall exhibit no discoloration or loss of adhesion by the introduction of synthetic perspiration.

Test Procedure

Prepare a strip of maple flooring as described in 3.2. Create a 1 inch pool of synthetic perspiration (see formula below) and cover with a watch glass. After 24 hours, remove the glass, blot dry and inspect the exposed area. Evaluation for any objectionable alteration of the surface, such as discoloration, change in gloss, blistering, softening, swelling, loss of adhesion or special phenomena will indicate failure.

Synthetic Perspiration:

Urea	0.172 g
Lactic Acid	0.250 g
Potassium Chloride	0.022 g
Water	99.358 g
Glycine	0.020 g
Sodium Chloride	0.175 g
Glucose	0.003 g.

4.16 Coefficient of Friction

Groups 2 through 5 must achieve a coefficient of friction reading between 0.50 to 0.70.

Test Procedure

Method: ASTM D 2047

Prepare three 9 x 9 inch maple panels according to 3.2. Using the James Machine, run 4 cycles on each panel, turning the panel 90° after each cycle. The coefficient of friction value is determined by averaging the values of all 12 cycles. Oil Based products should be allowed to dry/cure for 14 days before the test is conducted.

4.0 Specific Requirements and Test Procedures Cont'd.

4.17 Freeze-Thaw Resistance

Group 1(water-based) and 4-5 shall not exhibit any separation, stratification or coagulation when exposed to freezing temperatures and then permitted to thaw. Viscosity is to be measured before and after exposure.

Test Procedure

Method: ASTM D 2243

Pint containers of the coating will be subjected to three freeze/thaw cycles in accordance with ASTM D 2243. The coating will be evaluated by Stormer or Brookfield viscosity and visual inspection. After each freeze cycle, once the product has reached room temperature, stir the product to promote a homogeneous fluid. Measure the gloss in accordance with 4.3. Gloss should be measured at 60°. A greater than 3% change in gloss or a greater than 10% change in viscosity will indicate failure.

Approved Testing Facilities:

Case Laboratories Inc.
622 Route Ten
Whippany, NJ 07981
973-428-9666
Fax: 973-887-4419
E-mail: case@case-labs.com

Rolla Coatings Inc.
10545 CR 5440
Rolla, MO 65401
573-341-4419
E-Mail: mvandema@mst.edu

**Authorization for Laboratory Examination of Gymnasium Finishes
and Sealers in Accordance with the Specifications of
The Maple Flooring Manufacturers Association**

_____, 2011

Gentlemen:

We hereby authorize your laboratory to examine the following product for compliance with the applicable MFMA Specifications for its product type. We hereby furnish all of the information required.

1. Product Type (check one):

- | | | |
|-----------------------------|--------------------------|--------------------------|
| Urethane Oil Sealer | <input type="checkbox"/> | |
| Oleoresinous Oil Sealer | <input type="checkbox"/> | |
| Water Based Sealer | <input type="checkbox"/> | |
| Urethane Oil Surface Finish | <input type="checkbox"/> | |
| Semi Gloss | | <input type="checkbox"/> |
| Satin | | <input type="checkbox"/> |
| High Gloss | | <input type="checkbox"/> |
| Epoxy Ester Surface Finish | <input type="checkbox"/> | |
| Semi Gloss | | <input type="checkbox"/> |
| Satin | | <input type="checkbox"/> |
| High Gloss | | <input type="checkbox"/> |
| Water Based Finish | <input type="checkbox"/> | |
| Semi Gloss | | <input type="checkbox"/> |
| Satin | | <input type="checkbox"/> |
| High Gloss | | <input type="checkbox"/> |

2. Composition Category (Please Provide Data Denoted with ① or ②)

- | | | | | |
|--------------|--------------------------|----------------------|--------------------------|---------------|
| Oleoresinous | <input type="checkbox"/> | Urethane Oil | <input type="checkbox"/> | ② % N _____ |
| Epoxy Ester | <input type="checkbox"/> | Two Package Urethane | <input type="checkbox"/> | ① % NCO _____ |
| Other | <input type="checkbox"/> | (Identify) _____ | | |

• % NCO: Percent isocyanate of non-volatiles

② % N: Percent nitrogen of non-volatiles.

3. If product is Urethane-based, % ___ of free diisocyanate of non-volatiles (must be <1%)

4. Brand Name: _____

5. Recommended Purpose: _____

6. We manufacture the product: Yes No

7. The product can be purchased on the open market in original one gallon packages:

Yes No

If Yes, Where? _____

8. The product cannot be purchased on the open market, but we are willing to furnish a one gallon sample and an affidavit attesting to the fact that it represents the product as supplied to the trade.

Yes No

9. We enclose herewith all leaflets, literature, labels and instructions that describe our product and give directions and recommendations for its use. We also agree to provide any specialized products that we deem necessary to the application of the coating to be evaluated.

10. Phone No. product is to be listed under: _____

Manufacturer Information

We have enclosed our check for \$2450.00 to cover your charges for examining our product for compliance with the MFMA specifications. We understand that you will report to us either that the product qualifies and so certify that fact to the MFMA or specify which parts of the specification it does not meet.

We agree to assume the obligation to pay for a re-evaluation of the product and its procurement, during the period of approval, at the discretion of the MFMA.

Submitting Company Name

Phone/Fax Number

Street Address

City

State

Zip Code

Name of Signer (Print or Type)

Title

Signature

AFFIDAVIT

This document is furnished to authorize laboratory examination of the product listed below because the product is not obtainable on the open market.

County of: _____

State of: _____

Date: _____

I, _____, being duly sworn, depose and say:

1) That I am an officer of: _____
Submitting Company

2) That said Company sells: _____
Product Name

which is considered to be a:

Sealer Low Gloss Water Based

Low Gloss Gymnasium High Gloss Water Based
(Surface) Finish

High Gloss Gymnasium
(Surface) Finish

type coating for use on maple, beech and birch flooring.

3) That the one gallon sample, shipped the independent MFMA Testing Laboratory, listed herein, _____, under the brand name attested to above, is taken from stock and is truly representative of the product as it is supplied to the trade.

Signature of Officer

Title

Company

Subscribed and sworn to before me this

_____ day of _____ 20__

Signature of Notary Public

Notarial Seal