

LAMINATE FLOORING

SPECIFICATIONS AND TEST METHODS



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NALFA Standards Publication LF 01-2026
An American National Standard (ANSI)

LAMINATE FLOORING

Published by
North American Laminate Flooring Association

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Foreword

The North American Laminate Flooring Association has prepared this Standards Publication for use by manufacturers, suppliers, distributors, dealers, and consumers of laminate flooring. The performance values and test methods presented have been related as closely as possible to end-use applications, and consumer needs have been considered throughout.

The purpose of this Standards Publication is to provide tiered, minimum performance set of requirements for laminate flooring using standard test methods. Such performance requirements include but are not limited to: static load, thickness swell, impact resistance, light resistance, cleanability/stain resistance, wear resistance, dimensional tolerances, surface bond, flatness, openings, ledging and castor chair resistance. The requirement of this standard applies to laminate flooring upon manufacturer's completion and proper storage until first placed into service.

The procedures and criteria within this specification provide evaluation guidance regarding laminate products to meet various performance requirements. As testing capability improves, it is recognized that equivalent test methods may be considered, i.e. for properties such as measuring geometrical dimensions, squareness, etc. provided they can demonstrate improvement in accuracy of measurement and or reduced variation, without significant bias.

The Technical Committee works closely with trade organizations, consumers, manufacturers, and appropriate government agencies in the periodic review and revision of these standards.

In this 2026 publication for Laminate Flooring, efforts have been made to relate this Standard closely to the expected performance in application. During laminate flooring installation, the fabrication method and technique employed will have a definite bearing on product performance and service. Consult individual laminate flooring manufacturers for specific installation criteria.

Metric values for the test procedures and performance standards are regarded as the standard.

This standard is periodically reviewed by the Technical Committee for any revisions necessary to keep them up to date with advancing technology. Proposed or recommended revisions should be submitted to:

Technical Director North American Laminate
Flooring Association

Webster, Chamberlain, & Bean
1747 Pennsylvania Avenue, NW Suite 1000
Washington, DC 20006
(202) 785-9500

Section 1 – General

1.1 SCOPE

This product standard shall apply to the performance of laminate flooring.

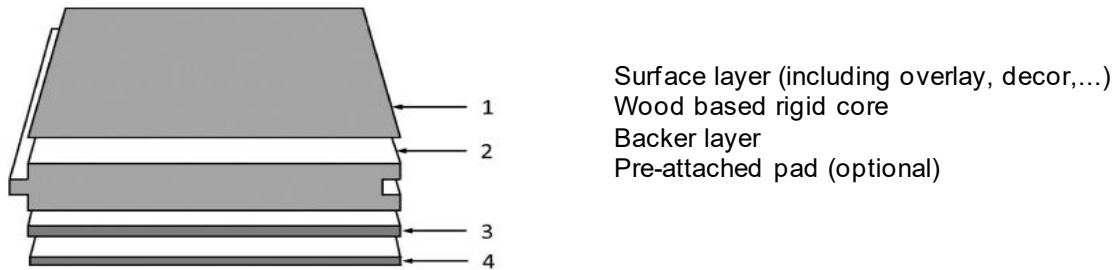


Figure 1 - Laminate flooring element structure

The standard will be useful in guiding manufacturers and educating consumers regarding minimum expectations or requirements of laminate flooring, by usage level: Residential, Light Commercial, General Commercial or Heavy Commercial.

For those methods where interlaboratory testing has been completed, an appropriate precision statement has been made.

1.2 GLOSSARY

Definitions related to this document can be found on NALFA [website](#).

1.3 REFERENCED STANDARDS and REGULATIONS

In this publication, references are made to the standards listed below. Copies are available from the indicated sources:

Technical Association of the Pulp & Paper Industry, Technology Park P.O. Box 105113, Atlanta, GA 30348 (770) 446-1400	TAPPI T-564, Size Estimation Chart www.tappi.org
California Air Resource Board, 1001 "I" Street P.O. Box 2815 Sacramento, CA 95812 800 242 4450	CCR 93120, Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products www.arb.ca.gov
House of Commons Ottawa, Ontario K1A 0A6 (866) 599-4999	Formaldehyde Emissions from Composite Wood Products Regulations (SOR/2021-148) (CANFER) Formaldehyde Emissions from Composite Wood Products Regulations
U.S. EPA Attention: Formaldehyde Mail code: 7404T 1200 Pennsylvania Ave., N.W. Washington, DC 20460	Title 40 > Chapter 1 > Subchapter R > Part 770, Code of Federal Regulations - Formaldehyde Standards for Composite Wood Products; TSCA Title VI compliance www.epa.gov/formaldehyde

1.4 FIRE RATING

Appendix A provides a list of commonly referenced specific test methods, including those referenced for fire ratings, which are typically used in determining the fire ratings which have been established by code-developing and specifying agencies such as National Fire Protection Association, International Code Council, and other local, state, and federal agencies. When fire ratings, or other special property ratings are required by specific code, Appendix A and the manufacturer of the product being specified should be consulted.

1.5 SURFACE SWELL

The NALFA Surface Swell test is a standardized procedure designed to assess how well a laminate flooring product can resist swelling when exposed to moisture on its surface. Overall, this helps manufacturers ensure that their laminate flooring products maintain their integrity and appearance when exposed to surface moisture. Although this property is not a requirement for the LF-01 test method, it can be verified and certified by NALFA. Please see the NALFA [website](#) for information about this test method and certification.

1.6 MACRO-SCRATCH RESISTANCE

The NALFA Macro-Scratch Resistance test is a standardized method used to evaluate the ability of laminate flooring to withstand surface scratching. The intent is to simulate scratching caused by objects being dragged or slid across the floor, resulting in deep, clearly visible scratches. The full test method procedure is available on the NALFA [website](#).

1.7 UNDERLAYMENT

For all products which utilize an attached underlayment, they shall be tested with the attached back instead of the underlayment for any test which specifies use of an underlayment. For tests where no underlayment is required, i.e. thickness swell, static load, etc., the laminate shall be tested by itself. Either the attached backer must be removed, or the product supplied separately in both attached and unattached format for testing purposes. If no underlayment is supplied when the product is submitted for testing, where underlayment is required, a 2.0mm $\pm$ /- 0.5mm (0.080in $\pm$ /- 0.02in) underlayment CERTIFIED to NALFA LF-03 tier 1 shall be used.

1.8 VISUAL INSPECTION

The inspector shall have normal sight and color vision, corrected if necessary. No magnification shall be used when viewing the specimens. If specific requirements for lighting conditions and viewing distance are needed, they are specified in the test procedures below.

1.9 CONDITIONING

For the purpose of test method standardization, a laminate flooring sample or specimen prior to evaluation shall be conditioned to constant weight (less than 0.1% deviation per 24 hours) unless denoted otherwise in the method. The conditioned environment shall be maintained at a temperature of 23°C $\pm$ 3°C (73°F $\pm$ 5°F) and 50% $\pm$ 5% relative humidity. If there is any departure from this recommended conditioning, it shall be stated in the test report.

Section 2 – Performance Properties and Values

2.1 PERFORMANCE PROPERTIES and MINIMUM PERFORMANCE VALUES

Usage Level		Residential	Light Commercial	General Commercial	Heavy Commercial
Certification Level		1	2	3	4
TEST METHOD	PROPERTY				
3.1	Static Load	≥ 6MPa (870 psi)		≥ 8MPa (1160 psi)	
3.2	Thickness Swell	≤ 18%	≤ 16%		≤ 12%
3.3	Light Resistance	No More than Slight Effect			
3.4	Cleanability / Stain resistance	Score ≤ 20 and No More Than Slight Effect			
3.5	Large Ball Impact Resistance	≥ 800 mm (31.5 in)	≥ 1000 mm (39.4 in)	≥ 1200 mm (47.3 in)	≥ 1400 mm (55.1 in)
3.6	Small Ball Impact Resistance	≥ 200 mm (7.9 in)		≥ 350 mm (13.8 in)	≥ 500 mm (19.7 in)
3.7	Wear (Abrasion) Resistance	≥ AC3		≥ AC4	≥ AC5
		≥ 2000 cycles		≥ 4000 cycles	≥ 6000 cycles
3.8	Dimensional Tolerances	Length ≤ 0.50 mm (0.020 in) Width ≤ 0.20 mm (0.008 in) Thickness ≤ 0.50 mm (0.020 in) Squareness ≤ 0.20 mm (0.008 in) Straightness ≤ 0.30 mm (0.012 in)			
3.9	Castor Chair Resistance	No Effect at 25000 cycles			No Effect at 35000 cycles
3.10	Surface Bonding	≥ 1.0 N/mm ²	≥ 1.25 N/mm ²		≥ 1.5 N/mm ²
3.11	Formaldehyde CARB & TSCA Title VI & CANFER	3rd party certificate "Core compliance"			
3.12	Flatness	$F_{W\ concave} \leq 0.15\%$ $F_{W\ convex} \leq 0.20\%$ $F_{I\ concave} \leq 0.15\%$ $F_{I\ convex} \leq 0.20\%$			
3.13	Openings	$O_{Avg} \leq 0.15\text{ mm}$ (0.006 in) $O_M \leq 0.2\text{mm}$ (0.008 in)			
3.14	Ledging	$h_{Avg} \leq 0.10\text{ mm}$ (0.004 in) $h_{Max} \leq 0.15\text{ mm}$ (0.006 in)			
Table 2-1 Performance Properties and Values					

Table 2-1 Performance Properties and Values

Section 3 Test Methods

3.1 STATIC LOAD

3.1.1 Scope

This test measures the ability of laminate flooring to resist residual indentation resulting from a static load.

3.1.2 Test Apparatus

3.1.2.1 Karol-Warner load frame modified for a 20:1 lever arm ratio or equivalent. See Photo 3-1

3.1.2.2 Conditioned environment maintained at $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($73^{\circ}\text{F} \pm 5^{\circ}\text{F}$) and $50\% \pm 5\%$ relative humidity.

3.1.2.3 Indenter plate (see Figure 3-1)

3.1.2.4 One inch micrometer with fool/anvil diameters of $6.35 \text{ mm} \pm 2.54 \text{ mm}$ ($0.250 \text{ in} \pm 0.10 \text{ in}$).

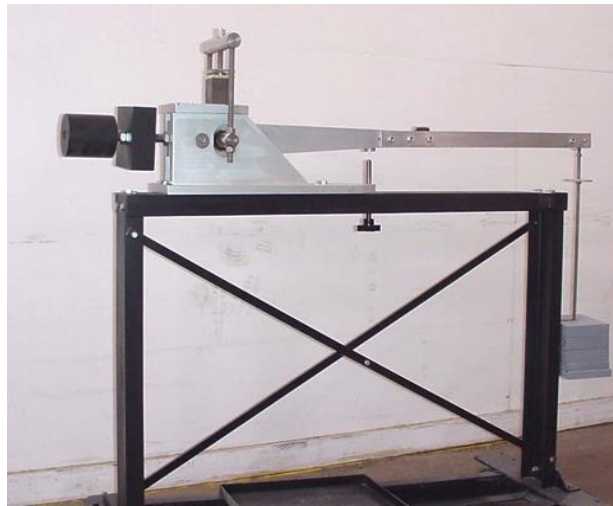


Photo 3-1

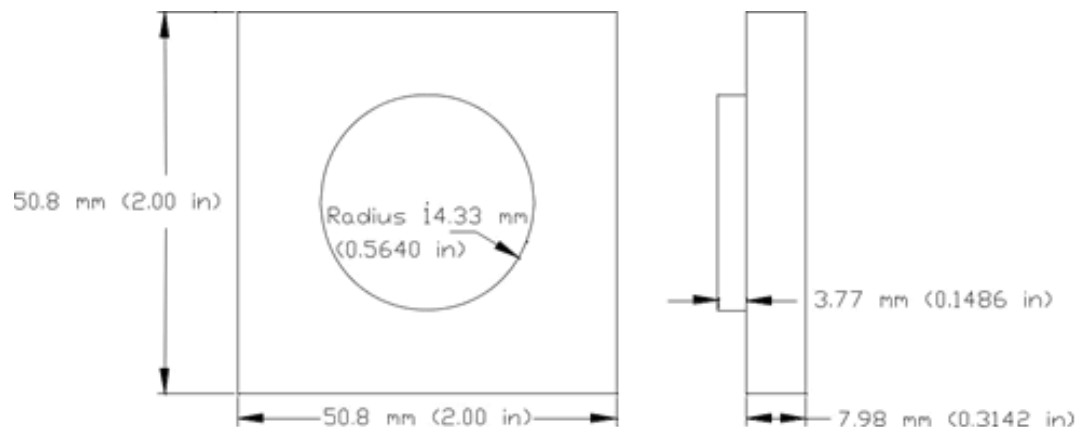


Figure 3-1

3.1.3 Specimens

- 3.1.3.1 Test specimens shall measure 50 mm x 50 mm x thickness (2 in x 2 in x thickness).
- 3.1.3.2 For materials having an attached underlayment, the underlayment shall be removed prior to testing. As an alternative, material shall be provided without the attached pad.

3.1.4 Procedure

- 3.1.4.1 Condition the specimens to constant weight (less than 0.1% deviation per 24 hours) in a conditioned environment unless denoted otherwise in the method.
- 3.1.4.2 Measure the thickness of the test specimen at the center of the face to be tested with the micrometer. Record the measurement as the initial thickness.
- 3.1.4.3 Place the specimen on the load rack platform with the circular face of the indenter against the face of the specimen.
- 3.1.4.4 Additional specimens and indenters may be added to the stack as allowed by equipment design.
- 3.1.4.5 Using the counterbalance of the load arm, tare the arm so that it rests freely in a horizontal position.
- 3.1.4.6 Adjust the arm pin so that the pin touches the top indenter plate when the arm is horizontal.
- 3.1.4.7 Adjust the support pin such that the specimen(s) are not impacted as weights are added to the arm.
- 3.1.4.8 Place weights on the arm so that the load to be applied to the specimen is 10.0 MPa $\pm$ 0.1 MPa (1450 psi $\pm$ 14.5 psi).
- 3.1.4.9 Release the support pin to load the specimen(s) to the designated weight.
- 3.1.4.10 Allow the specimen(s) to remain under load for 24 hours $\pm$ 0.25 hours.
- 3.1.4.11 Remove the load from the frame.
- 3.1.4.12 Remove the specimen(s) from the frame and allow it to recover 24 $\pm$ 0.25 hours.
- 3.1.4.13 Measure the thickness of the specimen at the same location as the initial measurement was obtained using the one-inch micrometer. Record this measurement as the final thickness.
- 3.1.4.14 Calculate the measured indentation as explained in 3.1.5.
- 3.1.4.15 If the measurement is less than or equal to 0.05 mm (0.002 in), the load used shall be reported. If the residual indentation is greater than 0.05 mm (0.002 in), decrease the load by 1.7 MPa (250 psi) and repeat steps 3.1.4.1 through 3.1.4.13 with a new specimen.

3.1.5 Calculations

- 3.1.5.1 Subtract the final thickness measurement from the initial thickness measurement. The difference is the residual indentation.

3.1.6 Report

The test report shall include the following:

- 3.1.6.1 Reference to this standard.
- 3.1.6.2 Description of the material under test.
- 3.1.6.3 The value of the maximum load applied which produces residual indentation of less 0.05 mm (0.002 in).
- 3.1.6.4 Any deviation from the specified test method.
- 3.1.6.5 Date of the test.

3.1.7 Precision & Bias

- 3.1.7.1 Test method precision and bias have not been established. Repeatability measurements for product thickness under no load gave a repeatability sigma of 0.009 mm (0.00035 in).

3.2 THICKNESS SWELL

3.2.1 Scope

This test measures the ability of laminate flooring to resist increase in thickness after being exposed to water.

3.2.2 Test Apparatus

- 3.2.2.1 Pan or other suitable apparatus for submerging specimens.
- 3.2.2.2 One-inch micrometer with foot/anvil diameters of $6.35 \text{ mm} \pm 2.54 \text{ mm}$ ($0.250 \text{ in} \pm 0.10 \text{ in}$).
- 3.2.2.3 Distilled or deionized water maintained at $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($68^{\circ}\text{F} \pm 2^{\circ}\text{F}$).
- 3.2.2.4 Ruler.

3.2.3 Specimens

- 3.2.3.1 A test specimen shall measure $150 \text{ mm} \times 150 \text{ mm} \times \text{thickness}$ ($6 \text{ in} \times 6 \text{ in} \times \text{thickness}$). Where material is less than 150 mm (6 inches) in one dimension of the face, select the specimen at the nominal width and trim all four sides to obtain smooth edges. Two specimens shall be collected for each test. Each specimen shall be taken from opposite ends of a plank or tile. Specimen's edges shall be smooth and squarely trimmed. They shall not be preconditioned.
- 3.2.3.2 For materials having an attached underlayment, the underlayment shall be removed prior to test. As an alternative, material shall be provided without the attached pad.

3.2.4 Procedure

- 3.2.4.1 Measure the thickness of each test specimen at the edge of the middle point of the four sides (see Figure 3-2). Record the measurements as the initial thickness. Submerge each specimen under the water so that the top face of each specimen is $25.4 \text{ mm} \pm 2.54 \text{ mm}$ ($1 \text{ in} \pm 0.1 \text{ in}$) from the surface of the water. Specimen's faces shall not rest against a flat surface as this impedes water circulation and absorption. Specimens shall remain submerged for a total of $24 \text{ hours} \pm 0.25 \text{ hours}$. At the end of the 24 hours, remove the specimens from the water. Repeat the measurements outlined in step 3.2.4.1 within 15 minutes of removal from the water. Record the measurements as the final thickness.

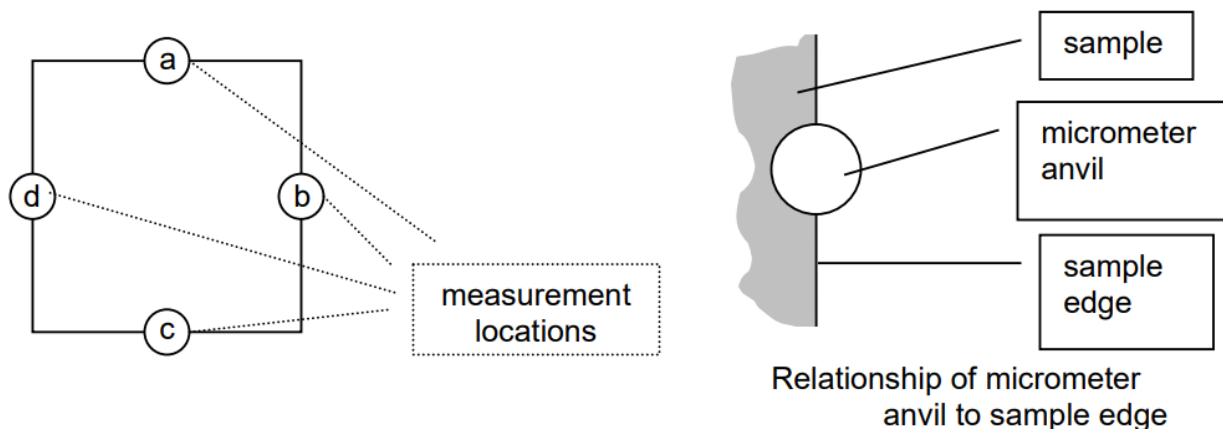


Figure 3-2

3.2.5 Calculations

- 3.2.5.1 Express the thickness swell as the average percentage increase in thickness. It is calculated for each edge as: $(\text{final thickness} - \text{initial thickness}) / \text{initial thickness} \times 100$
- 3.2.5.2 The eight percentage results are then averaged to obtain the thickness swell result.

3.2.6 Report

- 3.2.6.1 Reference to this standard.
- 3.2.6.2 Description of the material under test.
- 3.2.6.3 The average of the thickness measurements.
- 3.2.6.4 The thickness swell value.
- 3.2.6.5 Any deviation from the specified test method.
- 3.2.6.6 Date of the test.

3.2.7 Precision & Bias

- 3.2.7.1 Table 3-1 is based on interlaboratory studies conducted in 1999 involving three replicate tests of nine materials tested by nine laboratories.

<i>Material</i>	<i>Mean</i>	<i>S_r</i>	<i>S_R</i>	<i>I_r</i>	<i>I_R</i>
A	5.32%	0.30%	0.91%	0.84%	2.57%
B	6.87%	0.33%	1.08%	0.94%	3.05%
C	8.05%	0.32%	1.18%	0.89%	3.34%
D	8.08%	0.30%	1.87%	0.83%	5.26%
E	10.79%	0.54%	2.76%	1.53%	7.79%
F	11.77%	0.41%	1.38%	1.15%	3.90%
G	13.53%	0.57%	3.01%	1.61%	8.49%
H	14.55%	0.49%	2.23%	1.38%	6.28%
I	14.68%	0.47%	2.87%	1.31%	8.10%

Table 3-1

- 3.2.7.2 In Table 3-1, for the materials indicated:
 - 3.2.7.2.1 Mean is the average of test results for all replicates from all labs.
 - 3.2.7.2.2 S_r is the within-laboratory standard deviation of the mean and $I_r = 2.83 S_r$ (see 3.2.7.2.4 for application of I_r).
 - 3.2.7.2.3 S_R is the between-laboratory standard deviation of the mean and $I_R = 2.83 S_R$ (see 3.2.7.2.5 for application of I_R).
 - 3.2.7.2.4 Repeatability - In comparing two mean values for the same material obtained by the same operator using the same equipment on the same day, the means should be judged not equivalent if they differ by more than the I_r value for that material and condition.
 - 3.2.7.2.5 Reproducibility - In comparing two mean values for the same material obtained by different operators using different equipment on different days, the means should be judged not equivalent if they differ by more than the I_R value for that material and condition. (This applies between different laboratories or between different equipment within the same laboratory.)
- 3.2.7.3 The judgments per 3.2.7.2.4 and 3.2.7.2.5 will have an approximate 95% (0.95) probability of being correct.
- 3.2.7.4 Other materials may give somewhat different results.

3.3 LIGHT RESISTANCE

3.3.1 Scope

This test measures the ability of laminate flooring to retain its color when exposed to a light source having a frequency range approximating sunlight through window glass. It is not intended to show the resistance to continuous exposure to outdoor weathering conditions.

3.3.2 Test Apparatus

- 3.3.2.1 Xenon-arc light source capable of providing electromagnetic energy approximating sunlight with a spectral bandpass of approximately 280 nm to 800 nm with filtering appropriate to simulate sunlight through a window.
- 3.3.2.2 Conditioned environment maintained at $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($73^{\circ}\text{F} \pm 5^{\circ}\text{F}$) and $50\% \pm 5\%$ relative humidity.
- 3.3.2.3 Overhead lighting consisting of cool white (4000 Kelvin) light with the bulbs positioned parallel to the line of sight and providing an intensity of 800 lux to 1100 lux (75 foot-candles to 100 foot-candles) at the specimen surface when examined.

3.3.3 Specimens

- 3.3.3.1 The test specimen shall be of the size required by the sample holder of the Xenon-arc test apparatus.

3.3.4 Procedure

- 3.3.4.1 Condition the specimen for at least 48 hours prior to the test at a temperature of $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($73^{\circ}\text{F} \pm 5^{\circ}\text{F}$) and relative humidity of $50\% \pm 5\%$.
- 3.3.4.2 Mount the specimen in a masked holder such that approximately % of the sample face to be tested is covered, and the other half is exposed to the light source.
- 3.3.4.3 Operating set points for the exposure shall be as follows:
 - 3.3.4.3.1 Black Panel Temperature $70^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($158^{\circ}\text{F} \pm 5^{\circ}\text{F}$)
 - 3.3.4.3.2 Dry Bulb Temperature* $50^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($122^{\circ}\text{F} \pm 5^{\circ}\text{F}$)
 - 3.3.4.3.3 Wet Bulb Temperature $39^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($102^{\circ}\text{F} \pm 2^{\circ}\text{F}$) to maintain $50\% (\pm 5\%)$ Relative Humidity
 - 3.3.4.3.4 Conditioning Water $20^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($68^{\circ}\text{F} \pm 5^{\circ}\text{F}$)
 - 3.3.4.3.5 Duration of Exposure 100 hours ± 0.5 hour
 - 3.3.4.3.6 Calibration wavelength 420 nm
 - 3.3.4.3.7 Rate of Irradiance $1.10 \text{ W/m}^2 \pm 0.03 \text{ W/m}^2$
 - 3.3.4.3.8 Total Irradiance 396 kJ/m^2 2.00 kJ/m^2
 - 3.3.4.3.9 Automatic control of power to the light source to maintain a constant irradiance level and accommodate for aging effect of light sources and solarization of filters.
- *Note: The Black Panel Temperature is the primary controlled temperature, and the Dry Bulb Temperature is secondary control.
- 3.3.4.4 Expose the specimen to the light source as outlined in 3.3.4.3.
- 3.3.4.5 At the conclusion of the exposure period, remove the specimen from the holder and allow it to recover for 24 hours ± 1 -hour without exposure to light at a temperature of $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($73^{\circ}\text{F} \pm 5^{\circ}\text{F}$) and relative humidity of $50\% \pm 5\%$.
- 3.3.4.6 At the conclusion of the recovery period, examine the specimen by placing it, without pre-inspection, on a horizontal surface having the illumination as outlined in 3.3.2.3 and then viewing the specimen at an eye-to-specimen distance of approximately 750 mm to 900 mm (30 in to 36 in) and at an angle of approximately 45° to 75° from the horizontal plane. The specimen shall be rotated in the horizontal plane and viewed from all directions. Light sources other than that outlined in 3.3.2.3, which can accentuate or minimize effects, shall be avoided.

3.3.4.7 Grade the specimen as follows:

No effect - no noticeable change in color or surface finish.

Slight effect - a change in color or surface finish visible only at certain angles and directions.

Moderate effect - a change in color or surface finish visible at all angles and directions but does not notably alter the original condition of the specimen.

Severe effect - a change in color or surface finish which markedly alters the original condition of the specimen.

3.3.5 Report

3.3.5.1 Reference to this standard.

3.3.5.2 Description of the material under test.

3.3.5.3 The light resistance.

3.3.5.4 Any deviation from the specified test method.

3.3.5.5 Date of the test.

3.3.6 Precision & Bias

3.3.6.1 Because the measurement outcome for this test is a discrete result and subjective in nature, precision and bias cannot be determined.

3.4 CLEANABILITY AND STAIN RESISTANCE

3.4.1 Scope

This test measures both the ease of cleanability and stain resistance of laminate flooring to common household substances.

3.4.2 Test Apparatus

- 3.4.2.1 Concave glass covers, 25 mm (1 in) in diameter with fire-polished rims.
- 3.4.2.2 Overhead lighting consisting of cool white (4000 Kelvins) light with the bulbs positioned parallel to the line of sight and providing an intensity of 800 lux to 1100 lux (75 to 100 foot-candles) at the specimen surface when examined.
- 3.4.2.3 Nylon bristle brush.
- 3.4.2.4 One-kilogram mass.
- 3.4.2.5 Cellulose sponge measuring 75 mm x 100 mm x 50 mm (3 in x 4 in x 2 in).
- 3.4.2.6 Clean, soft cloth.
- 3.4.2.7 Cotton balls.
- 3.4.2.8 Non-abrasive commercial cleaner specifically formulated to include laminate flooring
- 3.4.2.9 A 5.0% $\pm$ 0.5% solution of sodium hypochlorite.
- 3.4.2.10 Baking soda (as a mild abrasive household cleaner).
- 3.4.2.11 Water.
- 3.4.2.12 Acetone.
- 3.4.2.13 Test Reagents as specified in Table 3-2:

Reagent Number	Reagent	Preparation	Application
1	Distilled water	As received	Apply 2 drops (6mm spot) and cover with watch glass
2	Ethanol solution	A solution of 50% ethanol and 50% distilled water	As above
3	Acetone	As received	As above
4	Household ammonia	As received (non-sudsing type)	As above
5	10% Citric acid	A solution of 10% citric acid in distilled water	As above
6	Vegetable oil	As received	As above
7	Coffee	1 teaspoon instant coffee per 180 ml distilled water	As above
8	Tea	Brew 1 tea bag per 120ml distilled boiling water for 2min	As above
9	Catsup	As received	As above
10	Mustard	As received	As above
11	10% Povidone iodine	As received	As above
12	Black permanent marker	As received	Mark 6 mm spot. Do not cover
13	#2 pencil	As received	As above
14	Wax crayon	As received	As above
15	Black paste shoe polish	As received	As above

Table 3-2

3.4.3 Specimens

- 3.4.3.1 The test specimen shall have an area sufficient to permit placement of all test reagents on the surface in two lines. Individual reagents shall be placed about 50 mm (2 in) apart but in no circumstances less than 25 mm (1 in) apart. A specimen that measures 100 mm x 400 mm x thickness (4 in x 16 in x thickness) is adequate.

3.4.4 Procedure

- 3.4.4.1 Using the commercial cleaner in 3.4.2.8, clean the surface of the specimen with a soft cloth. Rinse the specimen with water and dry with a clean, soft, cloth. Allow the specimen to dry thoroughly at a temperature of $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($73^{\circ}\text{F} \pm 5^{\circ}\text{F}$).
- 3.4.4.2 Position the specimen horizontally to minimize movement of stain reagents after application.
- 3.4.4.3 Mark the specimen so that the location of each reagent can be identified.
- 3.4.4.4 Place a 6 mm (1/4 in) spot of each reagent upon the surface of the specimen.
- 3.4.4.5 Place a watch glass, concave side down, over each reagent as indicated in 3.4.2.13. Move each watch glass such that the covered reagent comes in contact with the full rim of the watch glass. Now using the watch glass, spread the reagent to create a uniform coating on the laminate product's surface, making sure the reagent is not allowed to contact other reagents or any surface identification markings. Position the watch glass such that the reagent is partially covered, partially uncovered during the test exposure period.
- 3.4.4.6 Allow the specimen to stand undisturbed for a period of 16 hours to 24 hours at room temperature.
- 3.4.4.7 At the end of the test period, remove the watch glass covers and clean the specimen as follows.
- 3.4.4.8 After each of the following steps in the cleaning procedure observe the specimen by placing it, without pre-inspection, on a horizontal surface having the illumination as outlined in 3.4.2.2 and then viewing the specimen at an eye-to-specimen distance of approximately 750 mm to 900 mm (30 in to 36 in) and at an angle of approximately 45° to 75° from the horizontal plane. The specimen shall be rotated in the horizontal plane and viewed from all directions. Light sources other than that outlined in 3.3.2.3, which can accentuate or minimize effects, shall be avoided.
- 3.4.4.9 Cleaning Procedures:
- 3.4.4.9.1 Flush the surface with tap water and wipe gently with a sponge moistened with water. Blot the surface with a clean, soft cloth. If the test reagent is removed by this step, it shall be graded a "0". If a stain remains for a reagent, proceed to the next step. ***
- 3.4.4.9.2 Wet the test specimen surface with the commercial cleaner. Moisten the cellulose sponge with a commercial cleaner and place a 1 kg (2.20 lb) weight on its top. Push the weighted sponge back and forth without downward pressure for 25 cycles. Rinse the test specimen with water and wipe dry using a clean, soft cloth. If the test reagent is removed by this step, it shall be graded "1". If any stains remain, proceed to the next step. ***
- 3.4.4.9.3 Wet the test specimen surface with the commercial cleaner and add baking soda to achieve a paste consistency. Using a stiff nylon bristle brush, scrub the remaining areas where staining reagents can still be observed for 25 cycles. The specimen shall not be rubbed so as to permanently mar the surface finish. Rinse the test specimen with water and wipe dry using a clean, soft cloth. If the test reagent is removed by this procedure, it shall be graded "2". If any stains remain, proceed to the next step. ***
- 3.4.4.9.4 Using a cotton ball saturated with the acetone, rub the stain gently for up to two minutes. Rinse the specimen with water and wipe dry using a clean, soft cloth. If the test reagent is removed by this procedure, it shall be graded "3". If any stains remain, proceed to the next step. ***
- 3.4.4.9.5 Place a cotton ball saturated with hypochlorite bleach on the stain and allow it

to remain in contact for a period of two minutes. Rinse the specimen with water and wipe dry using a clean, soft cloth. If the test reagent is removed by this procedure, it shall be graded "4". ***

- 3.4.4.9.6 If any test reagent remains visible after 3.4.4.9.5, the test reagent shall receive a grade of "5". ***

*** Note: The intent is to evaluate residual staining and chemical attack of the laminate surface. Residual stain residue must be completely removed from the surface to properly assess the effects of staining and chemical attack. For textured products, more aggressive cleaning may be utilized to remove chemical reagent, provided it does not damage the surface. E.g. use of a medium bristle brush is acceptable in conjunction with cleaning agent.

3.4.5 Calculations

- 3.4.5.1 Total the grades received for each of the stain reagents. The possible range is 0 to 75. This becomes the Cleanability score.
- 3.4.5.2 For each reagent, evaluate the remaining stain as follows:
- No effect** - No noticeable change in color or surface finish.
- Slight effect** - Change in color or surface finish that is visible only at certain angles and directions. Typically, difficult to see.
- Moderate effect** - Change in color or surface finish visible at all angles and directions but does not notably alter the original condition of the specimen. Visible, but typically light in color or change from original.
- Severe effect** - Change in color or surface finish which markedly alters the original condition of the specimen. Typically, easy to see.

3.4.6 Report

- 3.4.6.1 Reference to this standard.
- 3.4.6.2 Description of the material under test.
- 3.4.6.3 The Cleanability score.
- 3.4.6.4 All reagents which caused a Slight, Moderate, or Severe Effect.
- 3.4.6.5 Any deviation from the specified test method.
- 3.4.6.6 Date of the test.

3.4.7 Precision & Bias

- 3.4.7.1 Because the measurement outcome for this test is a discrete result and subjective in nature, precision and bias cannot be determined.

3.5 LARGE BALL IMPACT RESISTANCE

3.5.1 Scope

This test measures the ability of laminate flooring to resist fracture due to impact by a large diameter ball.

3.5.2 Test Apparatus

- 3.5.2.1 Impact apparatus as shown in Figure 3-3 or equivalent. Overhead lighting consisting of cool white fluorescent light with the bulbs positioned parallel to the line of sight and providing an intensity of 800 lux to 1100 lux (75 foot-candles to 100 foot-candles) at the specimen surface when examined. LED equivalent lighting is also allowed.
- 3.5.2.2 Polished steel ball weighing $224 \text{ g} \pm 3 \text{ g}$ ($7.90 \text{ oz} \pm 0.11 \text{ oz}$), measuring 38.1 mm (1-1/2 inches) in diameter. The spherical surface shall have no damaged or flattened surface.
- 3.5.2.3 Clamping jig capable of holding the test specimen flat. See Figure 3-4, or the equivalent.
- 3.5.2.4 For product with no attached pad, manufacturer's underlayment or CERTIFIED to NALFA LF-03 tier 1 underlayment with a thickness of $2.0\text{mm} \pm 0.5\text{mm}$ ($0.080\text{in} \pm 0.02\text{in}$) shall be used.
- 3.5.2.5 Conditioned environment maintained at $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($73^{\circ}\text{F} \pm 5^{\circ}\text{F}$) and $50\% \pm 5\%$ relative humidity.
- 3.5.2.6 Black, water washable marking pen (suitable for overhead transparencies).
- 3.5.2.7 A clean, damp, soft cloth.

3.5.3 Specimens

- 3.5.3.1 Specimens shall be 300 mm x 300 mm x thickness (12 in x 12 in x thickness). Where material is less than 300 mm (12 in) in one dimension of the face, the specimen shall measure 300 mm x nominal width x nominal thickness (12 in x nominal width x nominal thickness). For narrow width specimens, the option exists to test a joined or built-up sample or to test a wider construction plank or tile that may exist for that particular product line.

3.5.4 Procedure

- 3.5.4.1 Condition the specimens for at least 48 hours prior to the test at a temperature of $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($73^{\circ}\text{F} \pm 5^{\circ}\text{F}$) and a relative humidity of $50\% \pm 5\%$.
- 3.5.4.2 For products with no attached pad, place the specimen on the underlayment of similar size as the specimen and place the assembly on the clamping base of the apparatus.
- 3.5.4.3 Loosely clamp the specimen/foam assembly to the base to immobilize the specimen but not compress the underlayment.
- 3.5.4.4 Adjust the measurement scale so that it touches the surface of the specimen.
- 3.5.4.5 Position the electromagnet at any arbitrary height above the test specimen.
- 3.5.4.6 Place the ball on the electromagnet and drop the ball. Catch the ball on the first rebound so that multiple impacts do not occur. Impact positions shall be at least 50 mm (2 in) apart and 50 mm (2 in) from any edge of the specimen.
- 3.5.4.7 Use the marking pen to ink over impact points caused by the ball. Use the clean, damp, soft cloth to wipe each impact point. Fractures may appear as hairline cracks, concentric circles, or chips.

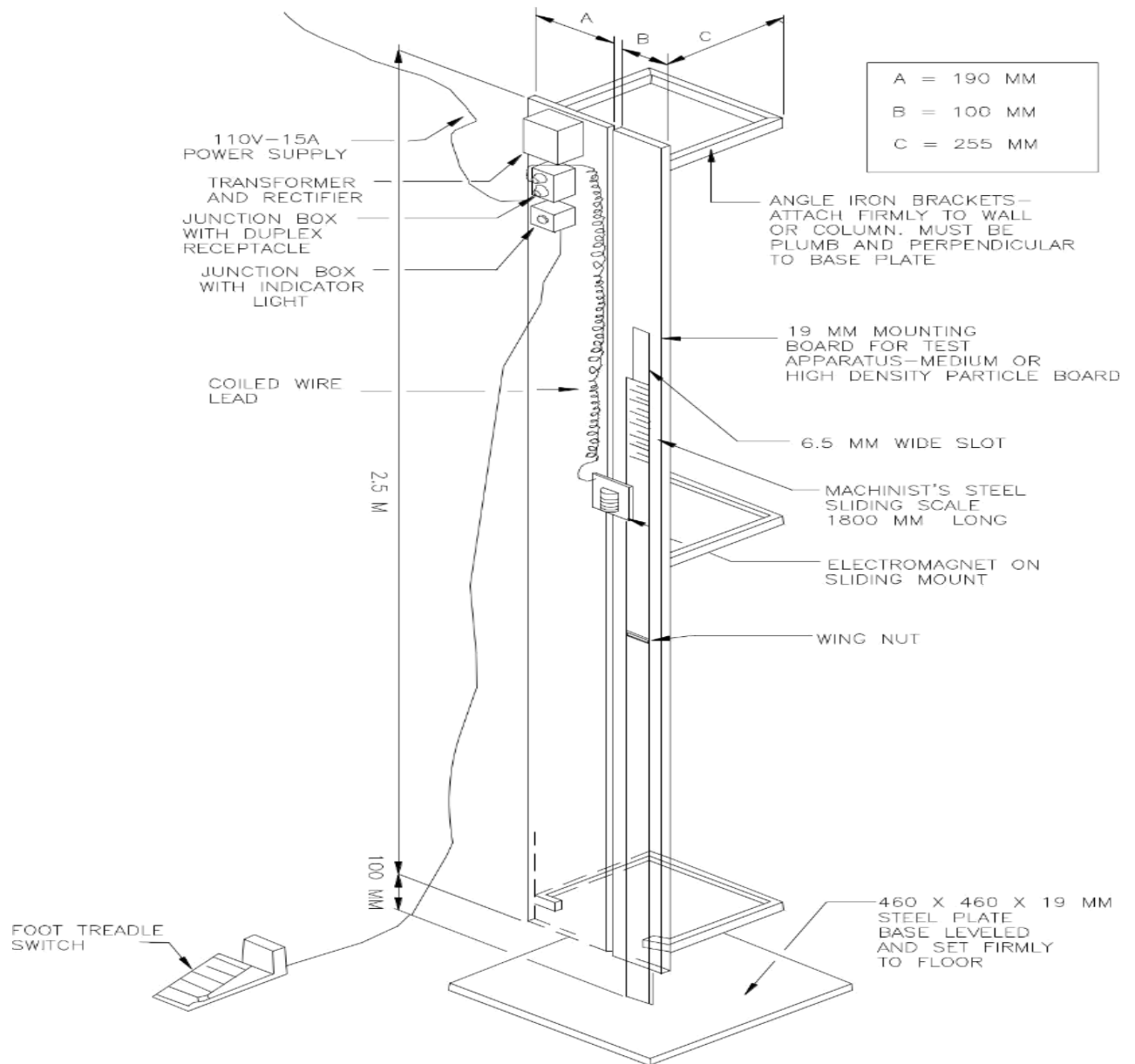


Figure 3-3

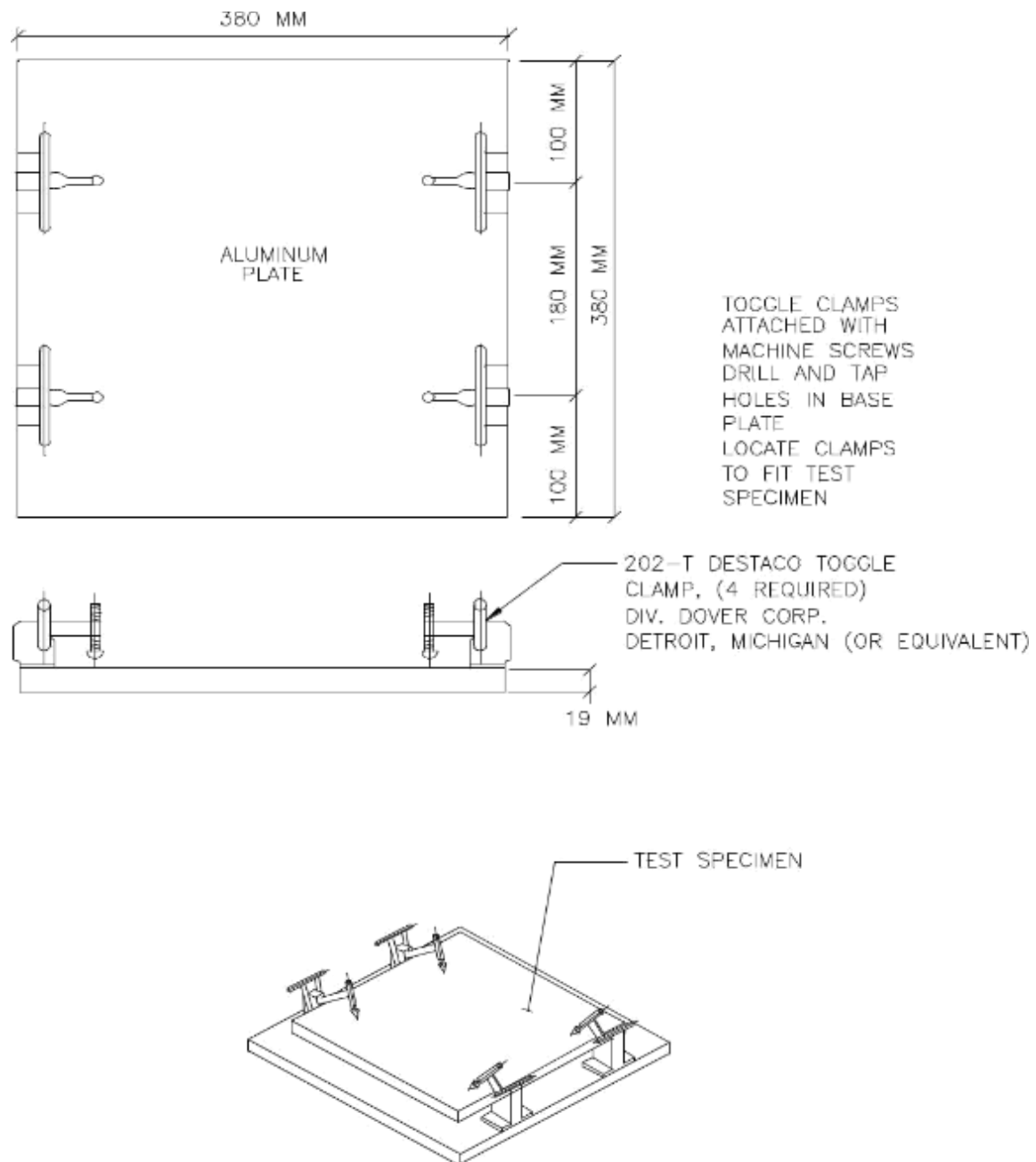


Figure 3-4

- 3.5.4.8 Examine the impact spot for cracks and fractures.
- 3.5.4.9 Raise or lower the electromagnet height as necessary and repeat steps 3.5.4.6 through 3.5.4.8 until the maximum height at which no cracks or fractures occur is determined.
- 3.5.4.10 Drop the ball from the height determined in step 3.5.4.9 two additional times in different locations on the test specimen. If either drop fails, reduce the height by 25 mm (1 in) and continue testing until a total of three successful results have been obtained at that height.

3.5.5 Report

- 3.5.5.1 Reference to this standard.
- 3.5.5.2 Description of the material under test.
- 3.5.5.3 Maximum height (mm) achieved in three replicate impacts without a visible fracture on the laminate flooring surface.
- 3.5.5.4 Any deviation from the specified test method.
- 3.5.5.5 Date of the test.

3.5.6 Precision & Bias

- 3.5.6.1 Table 3-3 is based on interlaboratory studies involving three replicate tests of nine materials tested by six laboratories.

<i>Material</i> <i>I</i>	<i>Mean</i>	<i>S_r</i>	<i>S_R</i>	<i>I_r</i>	<i>I_R</i>
A	1172	58	260	164	732
B	1268	52	355	147	1001
C	1437	130	404	366	1138
D	1573	79	422	223	1191
E	1575	156	309	440	873
F	1784	74	451	209	1271
G	1977	136	377	382	1064
H	2020	75	348	211	982
I	2087	145	469	409	1324

Table 3-3

- 3.5.6.2 In Table 3-3, for the materials indicated:
 - 3.5.6.2.1 Mean is the average of test results for all replicates from all labs.
 - 3.5.6.2.2 S_r is the within-laboratory standard deviation of the mean and $I_r = 2.83S_r$ (see 3.5.6.2.4 for application of I_r).
 - 3.5.6.2.3 S_R is the between-laboratory standard deviation of the mean and $I_R = 2.83S_R$ (see 3.5.6.2.5 for application of I_R).
 - 3.5.6.2.4 Repeatability - In comparing two mean values for the same material obtained by the same operator using the same equipment on the same day, the means should be judged not equivalent if they differ by more than the I_r value for that material and condition.
 - 3.5.6.2.5 Reproducibility - In comparing two mean values for the same material obtained by different operators using different equipment on different days, the means should be judged not equivalent if they differ by more than the I_R value for that material and condition. (This applies between different laboratories or between different equipment within the same laboratory.)
- 3.5.6.3 The judgments per 3.5.6.2.4 and 3.5.6.2.5 will have an approximate 95% (0.95) probability of being correct.
- 3.5.6.4 Other materials may give somewhat different results.

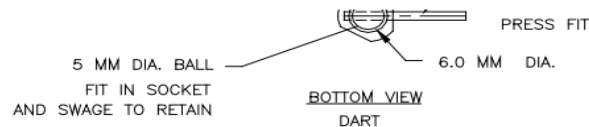
3.6 SMALL BALL IMPACT RESISTANCE

3.6.1 Scope

This test measures the ability of laminate flooring to resist fracture due to impact by a small diameter ball.

3.6.2 Test Apparatus

- 3.6.2.1 Impact apparatus as shown in Figure 3-5.
- 3.6.2.2 Impact dart weighing $25.0 \text{ g} \pm 0.5 \text{ g}$ ($0.88 \text{ oz} \pm 0.02 \text{ oz}$). It shall consist of a steel or brass dart tipped with a 5 mm (0.197 in) diameter steel ball. The spherical surface of the ball shall have no damaged or flattened surface. See Figure 3-5.
- 3.6.2.3 Dry graphite lubricant.
- 3.6.2.4 Overhead lighting consisting of cool white (4000 Kelvin) light with the bulbs positioned parallel to the line of sight and providing an intensity of 800 lux to 1100 lux (75 foot-candles to 100 foot-candles) at the specimen surface when examined.
- 3.6.2.5 Black, water washable marking pen (suitable for overhead transparencies).
- 3.6.2.6 For product with no attached pad, manufacturer's underlayment or CERTIFIED to NALFA LF-03 tier 1 underlayment with a thickness of $2.0 \text{ mm} \pm 0.5 \text{ mm}$ ($0.080 \text{ in} \pm 0.02 \text{ in}$) shall be used
- 3.6.2.7 Conditioned environment maintained at $23^\circ\text{C} \pm 3^\circ\text{C}$ ($73^\circ\text{F} \pm 5^\circ\text{F}$) and $50\% \pm 5\%$ relative humidity.
- 3.6.2.8 Clean, soft cloth.

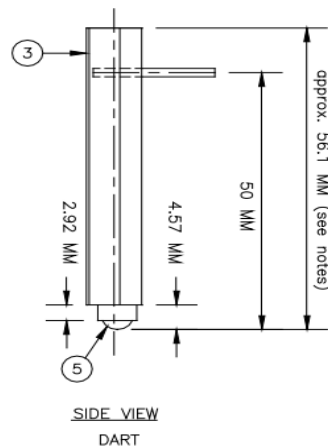


NOTE 1:

SCRIBE LINES AND ENGRAVE NUMBERS
0 TO 750 MM AT 25 MM INCREMENTS
BEGINNING 50 MM FROM BASE

NOTE 2:

- A. FABRICATE DARTS FROM
10 MM DIA. COLD ROLLED
STEEL ROD
- B. 25 GM. (± 0.05) DART LENGTH IS
APPROX. 56.1MM
- C. MODIFIED TRIANGULAR SHAPE
IS TO REDUCE DROPPING
FRICTION
- D. HANDLE (PART #4) PASSES THROUGH
THE SLOT OF THE GUIDE TUBE (PART #2)



DART IMPACT TEST APPARATUS		
NO.	NAME	DESCRIPTION
1	POLYETHYLENE BASE	57 MM O.D. X 13 MM I.D. X 25 MM H.
2	GUIDE TUBE	13 MM DIA. X 1.0 MM WALL X 915 MM H.
3	DART	10 MM (.375 IN.) O.D. STL. ROD
4	HANDLE	2.0 MM DIA X 19.0 MM L. STL. ROD
5	BALL	5 MM DIA. STL.

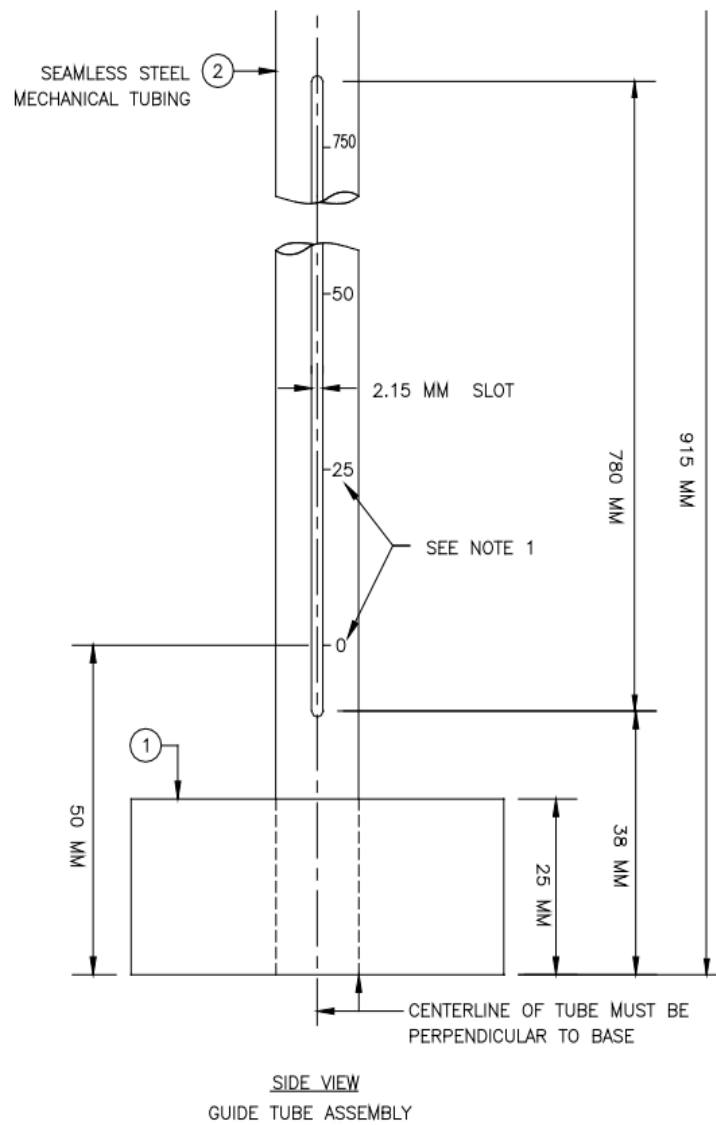


Figure 3-5

3.6.3 Specimens

- 3.6.3.1 Specimens shall be 200 mm x 200 mm x thickness (8 in x 8 in x thickness). In cases where material is less than 200 mm (8 in) in one dimension of the face, the specimen shall measure 200 mm x nominal width x nominal thickness (8 in x nominal width x nominal thickness).

3.6.4 Procedure

- 3.6.4.1 Condition the samples for at least 48 hours prior to the test at a temperature of $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ($73^{\circ}\text{F} \pm 5^{\circ}\text{F}$) and a relative humidity of $50\% \pm 5\%$.
- 3.6.4.2 Lubricate the inside diameter of the tube assembly with the dry graphite lubricant to minimize friction with the dart.
- 3.6.4.3 For products with no attached pad, place the specimen face up, on underlayment foam of similar size as the specimen.
- 3.6.4.4 Place the specimen/underlayment assembly face up on a rigid horizontal surface.
- 3.6.4.5 Place the impact apparatus on the decorative surface of the specimen so that the edge of the round base is tangent to two edges of the specimen at one corner. The bottom of the circular base shall be flush against the face of the specimen.
- 3.6.4.6 Position the dart at a height of 125 mm (5 in).
- 3.6.4.7 Release the dart and impact the face of the specimen. Catch the dart when it rebounds so that multiple impacts do not occur.
- 3.6.4.8 Move the dart to the right 15 mm (5/8 in) while keeping the edge of the circular base tangent to one edge of the specimen. See Figure 3-6.
- 3.6.4.9 Position the dart at a height of 150 mm (6 in).
- 3.6.4.10 Release the dart and impact the face of the specimen. Catch the dart when it rebounds so that multiple impacts do not occur.
- 3.6.4.11 Repeat steps 3.6.4.9 and 3.6.4.10 while increasing the dart release height by 25 mm (1 in) with each impact along the first edge of the specimen.
- 3.6.4.12 Use the marking pen to ink the impact points.
- 3.6.4.13 Wipe the impact points with a clean, soft cloth to remove excess ink.
- 3.6.4.14 Failures are cracks and fractures that appear as hairline cracks, concentric circles, or chips. Dents without breaking the surface do not indicate failure.
- 3.6.4.15 Beginning with the impact point of lowest height, follow the impact point path of increasing impacts heights until 3 consecutive failures occur. If three consecutive failures are not observed, continue with steps 3.6.4.11 through 3.6.4.14 along edge two of the specimen.
- 3.6.4.16 Edge three and edge four may be used as needed until failure is noted, or the highest impact release point is achieved without failure.
- 3.6.4.17 The impact resistance is the height value immediately preceding the series of three consecutive failures

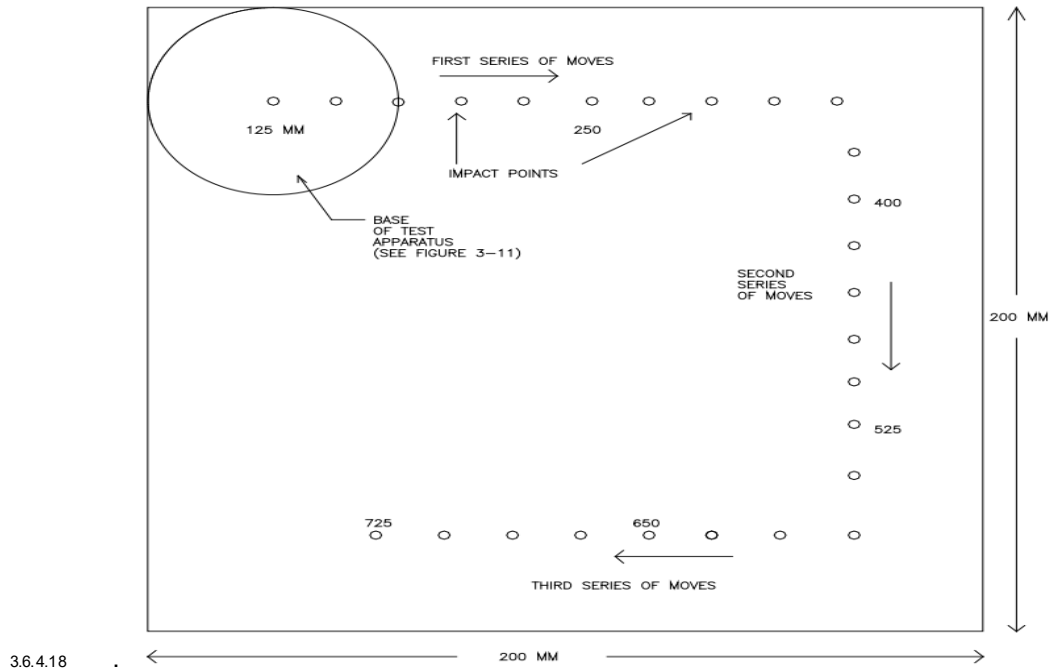


Figure 3-6

3.6.5 Report

- 3.6.5.1 Reference to this standard.
- 3.6.5.2 Description of the material under test.
- 3.6.5.3 Impact resistance as determined in 3.6.4.17.
- 3.6.5.4 Any deviation from the specified test method.
- 3.6.5.5 Date of the test.

3.6.6 Precision & Bias

- 3.6.6.1 Table 3-4 is based on interlaboratory studies conducted in 2001 involving three replicate tests of twelve materials tested by six laboratories.

<i>Material</i>	<i>Mean</i>	<i>S_r</i>	<i>S_R</i>	<i>I_r</i>	<i>I_R</i>
A	165	37	37	104	104
B	182	24	47	68	132
C	189	31	37	87	104
D	211	18	18	49	49
E	225	30	45	84	127
F	240	48	49	135	136
G	271	39	39	109	109
H	279	26	34	74	96
I	282	37	50	104	139
J	299	27	71	76	198
K	379	62	135	173	378
L	426	76	86	213	240

Table 3-4

- 3.6.6.2 In Table 3-4, for the materials indicated:
- 3.6.6.2.1 Mean is the average of test results for all replicates from all labs.
 - 3.6.6.2.2 S_r is the within-laboratory standard deviation of the mean and $I_r = 2.83S_r$ (see 3.6.6.2.4 for application of I_r).
 - 3.6.6.2.3 S_R is the between-laboratory standard deviation of the mean and $I_R = 2.83S_R$ (see 3.6.6.2.5 for application of I_R).
 - 3.6.6.2.4 Repeatability - In comparing two mean values for the same material obtained by the same operator using the same equipment on the same day, the means should be judged not equivalent if they differ by more than the I_r value for that material and condition.
 - 3.6.6.2.5 Reproducibility - In comparing two mean values for the same material obtained by different operators using different equipment on different days, the means should be judged not equivalent if they differ by more than the I_R value for that material and condition. (This applies between different laboratories or between different equipment within the same laboratory.)
 - 3.6.6.2.6 The judgments per 3.6.6.2.4 and 3.6.6.2.5 will have an approximate 95% (0.95) probability of being correct.
 - 3.6.6.2.7 Other materials may give somewhat different results

3.7 WEAR (ABRASION) RESISTANCE

3.7.1 Scope

3.7.1.1 This test measures the ability of the surface of laminate flooring to resist abrasive wear through the decor layer.

3.7.1.2. NALFA LF-01 uses Abrasion Class (AC) to categorize wear (abrasion) resistance. The NALFA required minimum performance for wear (abrasion) resistance is specified in NALFA LF-01 Table 2.1.

3.7.1.3. Note: EN 13329: *Laminate Floor Coverings Specifications, Requirements and Test Methods* and ISO 14486: *Laminate Floor Coverings - Specification* also utilize ISO 24338: *Determination of Abrasion Resistance*, procedure A and reference to the Abrasion Class (AC) rating to categorize wear (abrasion) resistance.

3.7.3 Procedure

NALFA specifies use of the equipment and method ISO 24338 Procedure A for the evaluation of wear (abrasion) resistance.

3.7.3.1 Test specimens

For each method, three laminate floor covering elements, taken at random are needed. Take from each element one test specimen, measuring approximately 100 mm x 100 mm: — One specimen located at 10 mm from the left short edge of the first element (see Figure 3-7-1). — one specimen exactly in the center of the second element (see Figure 3-7-1). — One specimen located at 10 mm from the right short edge of the third element (see Figure 3-7-1). Machined edges and machined surfaces shall be avoided in the specimens. If the thickness of the specimens exceeds 8 mm the specimens shall be milled down from the backside to $(7,5 \pm 0,5)$ mm to ensure a horizontal load of the abrader arms. Make sure that specimens are uniformly flat and parallel after milling. If the dimension of the elements makes the described sampling impossible, the test specimens shall be sampled from the nearest available area. If the elements measure less than 100 mm, then a joint is necessary. The joint shall be positioned in the middle of the 100x100 specimen.

Drill a $(7,2 \pm 0,1)$ mm center hole into the test specimen.

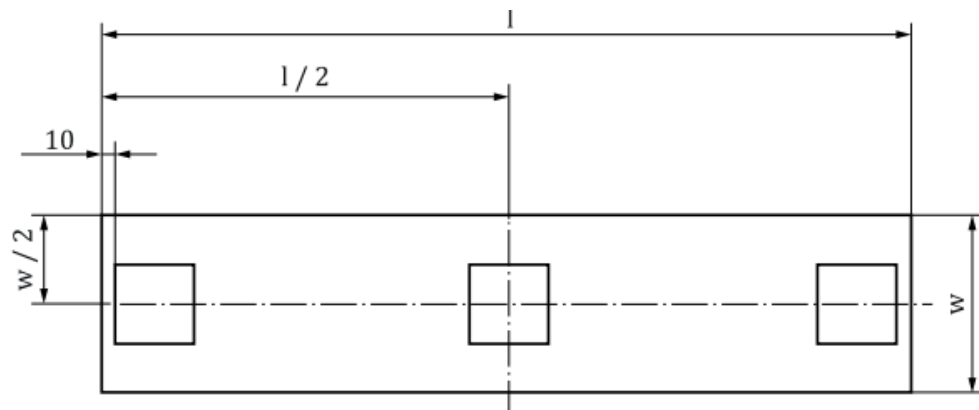


Figure 3-7-1: Sampling from one floor covering element

3.7.3.2 General

The resistance to wear is evaluated by abrading the face of test specimens with a specified abrasive paper applied by means of two loaded wheels. Characteristic rub-wear action is produced by contact of the test specimen, against the sliding rotation of the two abrading wheels. As the turntable rotates, the wheels are driven by the sample in opposite directions about a horizontal axis displaced tangentially from the axis of the sample. One abrading wheel rubs the specimen outward toward the periphery and the other, inward toward the center while a vacuum system removes loose debris during the test. The resulting abrasion marks form a pattern of crossed arcs in a circular band that cover an area approximately 30 cm².

3.7.3.3 Preparation of test specimens and abrasive papers

Precondition the test specimens and the abrasive papers for at least 24h in the conditioning chamber. After preconditioning, seal the paper strips in polythene bags (maximum 10 strips per bag) until required for immediate use. Clean the surface of the test specimens with an organic solvent which is immiscible with water. Using a marker pen, mark the surface of each test specimen with four lines mutually at 45° angles so that the surface area is divided into octants (see Figure 3-7-2) for abrasion evaluation.

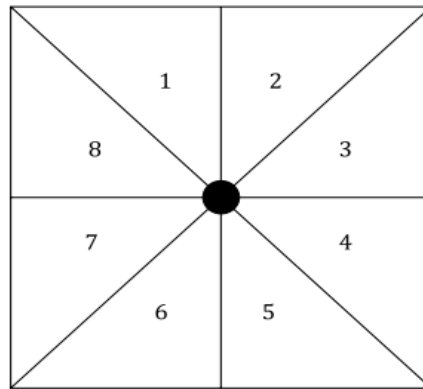


Figure 3-7-2: Division of the test specimens into octants

3.7.3.4 Preparation of abrasive wheels

Bond a strip of preconditioned unused abrasive paper to each of the rubber covered wheels. Ensure that the cylindrical surface is completely covered without any overlapping of the paper. The outside diameter of the finished assembled wheel shall be (50.90 ± 0.65) mm.

3.7.3.5 Determination of the abrasion rate of abrasive paper

Prepare two wheels with preconditioned unused abrasive paper from the same batch to be reserved for testing. Clamp a zinc plate in the test specimen holder, start the suction device, reset the revolution counter to zero, lower the wheels and abrade the zinc plate for 500 revolutions. Wipe the zinc plate clean and weigh to the nearest 1 mg. Renew the abrasive papers with preconditioned unused strips from the same batch and abrade the zinc plate for a further 500 revolutions. Wipe the zinc plate clean and weigh it again to the nearest 1 mg. The loss in mass shall be (120 ± 20) mg. Any lot of abrasive paper which causes a loss in mass outside this range shall not be used for testing.

3.7.3.6 Abrasion of test specimen

3.7.3.6.1 General

Perform the test immediately after the determination of the abrasion rate. Prepare two wheels with preconditioned unused abrasive paper from the same batch previously approved by determination of abrasion rate. Fit the wheels to the machine and reset the revolution-counter to zero. Clamp the first test specimen in the holder. Ensure that the surface of the test specimen is flat. Lower the wheels, start the suction device and abrade the test specimen. Examine the test specimen for abrasion after each 100 revolutions and renew the abrasive papers after every 200 revolutions. Continue the test in this way until the initial wear point (IP) is reached.

3.7.3.6.2 Abrasion evaluation method A - octants

The initial wear point (IP) is that point at which the first clearly recognizable wear-through of the décor layer appears and the sub-layer becomes exposed in 6 out of 8 octants. The initial wear point is reached when there are areas of at least 1.00 mm² wear-through in 5 octants and an area of 1.00 mm² wear-through becomes visible in a sixth octant. The sub-layer for printed décor paper is the background on which the pattern is printed. For plain colours, it is the first layer of different colour. For assessment, Figure 3-7-3 can be used.



a) Insufficient test: Wear-through with an area of at least 1,00 mm² is only evident in octant 6 and 7



b) Correct test: Wear-through of more than 1,00 mm² is not obtained in octants 4 and 5



c) Excessive test: Wear-through has passed beyond the initial wear point

Figure 3-7-3 — Assessment of initial point

3.7.3.7 Expression of results

Calculate the average of the IP-values obtained from the 3 test specimens to the nearest 100.

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3.7.4 Report

- 3.7.5.1 Reference to the test method used
- 3.7.5.2 Description of the material under test.
- 3.7.5.3 The average of the corrected initial point (IP), in revolutions, of the three samples rounded to the nearest 100 cycles
- 3.7.5.4 Wear (abrasion) resistance class (AC) as per table 2.1 based on the average of the corrected initial point (IP), in revolutions, of the three samples rounded to the nearest 100 cycles
- 3.7.5.4 Any deviation from the specified test method.
- 3.7.5.5 Date of the test.

3.8 DIMENSIONAL TOLERANCES

3.8.1 Scope

This test measures the dimensional variance between a tile or plank of laminate flooring in a manufactured free standing (unrestricted) shape in respect to thickness, length, width, straightness, and squareness.

3.8.2 Definitions

3.8.2.1 Test material shall be defined by the following orientation:

Length X = Axis of the greater length along the decorative face of the product.

Width Y = Axis of the lesser length along the decorative face of the product.

Thickness Z = Axis of the specimen from decorative face to back.

(Note: For products with the decorative face in a square format (all edges of equal nominal length), the X and Y axes are arbitrarily chosen from the orthogonal axis parallel to the edges of the product.)

3.8.3 Test Apparatus

3.8.3.1 Straight edge of length greater than the long axis (X-axis dimension) of the specimen and having maximum straightness deviation of 0.05 mm/m (0.0006 in/ft).

3.8.3.2 A flat horizontal surface of dimensions greater than the specimen.

3.8.3.3 A caliper of jaw capacity suitable for measuring the length (X-axis dimension) and width (Y-axis dimension) giving an accuracy of 0.05 mm (0.002 in).

3.8.3.4 A micrometer suitable for measuring thickness (Z-axis dimension) having flat and parallel circular measuring surfaces of 6.34 mm (0.25 in) diameter and an accuracy of 0.01 mm (0.0004 in).

3.8.3.5 Feeler gauge with thickness leaves in increments of 0.05 mm (0.002 in) and total range of 0.05 mm to 1.0 mm (0.002 in to 0.040 in).

3.8.3.6 The instruments utilized in this method shall have current NIST traceable certificates available to assure current calibration of the equipment.

3.8.3.7 Conditioned environment maintained at 23°C ± 3°C (73°F ± 5°F) and 50% ± 5% relative humidity.

Note: Feeler gauges cannot be certified.

3.8.4 Specimens

3.8.4.1 Test specimens shall be of the nominal size as produced by the manufacturer. The specimens shall not be restricted from movement during the tests (i.e. bonded to other materials).

3.8.4.2 Five (5) specimens shall constitute a set for purposes of dimensional testing.

3.8.5 Procedure

3.8.5.1 Condition the samples for at least 48 hours prior to the test at a temperature of 23°C ± 3°C (73°F ± 5°F) and a relative humidity of 50% ± 5%.

3.8.5.2 The specimen under test must be a single sample of nominal manufactured size.

3.8.5.3 The surfaces of the specimen must be free from foreign bodies and any protrusions from the face and edges of the specimen. These materials must be removed prior to the start of the test.

3.8.5.4 Proceed to the subsequent section of the method titled in the dimensional area for which tests are to be conducted. In the case of multiple parameters to be checked, the order of the tests is modeled after the order of this specification.

3.8.5.5 Length (X axis dimension)

3.8.5.5.1 Using a suitable caliper, close the jaws gently onto the edge of the decorative surface between which the length is to be determined. Do not force the instrument. (See Figure 3-8 for location of measurements).

3.8.5.5.2 Record the length indicated by the caliper to the nearest 0.05 mm (0.002 in).

- 3.8.5.5.3 Two length measurements (L), 20 mm (0.80 in) from each long edge parallel to the X-axis, are to be made on each of the five specimens for a total of ten length measurements.
- 3.8.5.5.4 Determine the maximum ($L_{\max}$) and minimum ($L_{\min}$) of the ten length values. Calculate the range of lengths (L_{range}) as $L_{\text{range}} = L_{\max} - L_{\min}$.
- 3.8.5.5.5 Report L_{range} .

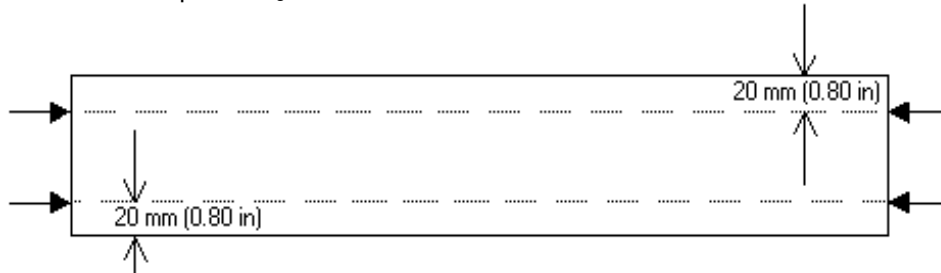


Figure 3-8

3.8.5.6 Width (Y axis dimension)

- 3.8.5.6.1 Using a suitable caliper, close the jaws gently onto the edge of the decorative surface between which the width is to be determined. Do not force the instrument. See Figure 3-9 for location of measurements.
- 3.8.5.6.2 Record the width indicated by the caliper to the nearest 0.05 mm (0.002 in).
- 3.8.5.6.3 Two width measurements (W), 150 mm (6 in) from each short edge parallel to the Y-axis, are to be made on each of the five specimens for a total of ten width measurements. (Note: On square tiles, the width measurements are made 20 mm (0.80 in) from the two edges not used for length measurements).
- 3.8.5.6.4
- 3.8.5.6.5 Determine the maximum ($W_{\max}$) and minimum ($W_{\min}$) of the ten width values. Calculate the range of widths (W_{range}) as $W_{\text{range}} = W_{\max} - W_{\min}$.
- 3.8.5.6.6 Report W_{range} .

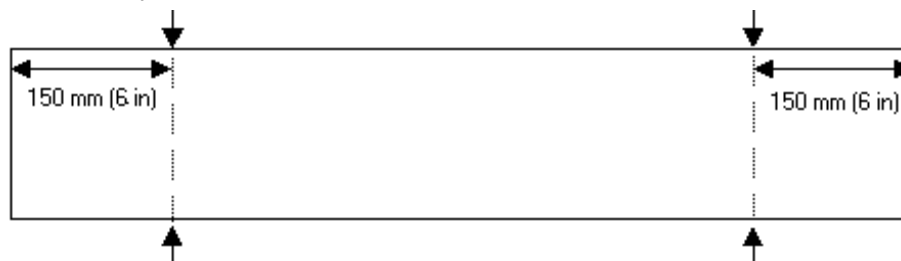


Figure 3-9

3.8.5.7 Thickness (Z axis dimension)

- 3.8.5.7.1 Using a suitable micrometer, close the jaws gently onto the surfaces between which the thickness is to be determined. Do not force the instrument. **See** Figure 3-10 for location of measurements.
- 3.8.5.7.2 Record the thickness indicated by the micrometer to the nearest 0.025 mm (0.001 in).
- 3.8.5.7.3 Four thickness measurements (T), 100 mm (4 in) from each short edge and 25 mm (1 in) from each long edge, are to be made on each of the five specimens for a total of 20 thickness measurements. See Figure 3-9.
- 3.8.5.7.4 Determine the maximum ($T_{\max}$) and minimum ($T_{\min}$) of the 20 thickness values. Calculate the range of thickness (T_{range}) as $T_{\text{range}} = T_{\max} - T_{\min}$.
- 3.8.5.7.5 Report T_{range} .



Figure 3-10

3.8.5.8 Straightness

3.8.5.8.1 Place the specimen, decorative layer up, on a flat horizontal surface.

3.8.5.8.2 Place the straight edge against the edge of the specimen parallel to the X-axis so that the straight edge is touching the specimen at the decorative edge.

3.8.5.8.3 If a gap is visible, insert vertically a feeler gauge of successive thickness leaves into the gap at the maximum deviation until the largest thickness leaf (L) that will fit without force into the gap is found.

Note[^] If the surface layer demonstrates a concave appearance, measure the gap at the point of maximum deviation and record the measured gap. See Figure 3-11. In this instance $S = L$.

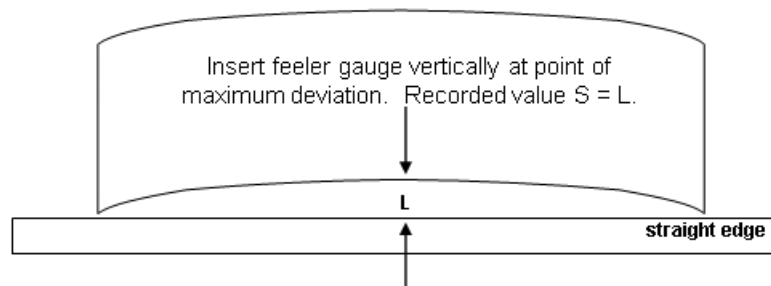
Note₂: If the surface layer demonstrates a convex appearance, place the decorative edge against the straight edge as illustrated in Figure 3-12. Measure the gap at the point of maximum deviation, calculate and record the value of measured gap/2 expressed as $S = L/2$.

3.8.5.8.4 Repeat 3.8.5.8.2 to 3.8.5.8.3 for the opposite and adjacent edges for a total of four values per test specimen.

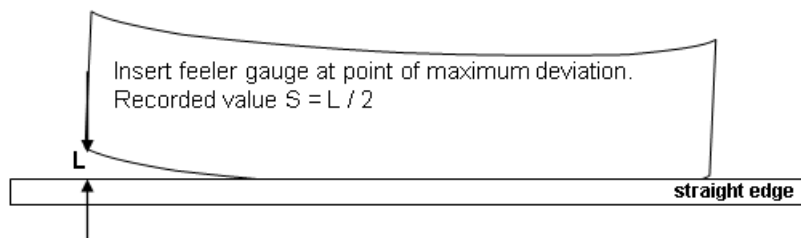
3.8.5.8.5 Repeat 3.8.5.8.1 to 3.8.5.8.4 for all 5 samples for a total of 20 values.

3.8.5.8.6 Calculate the maximum deviation from straightness (S_{max}) as the maximum of the 20 values determined in 3.8.5.8.5.

3.8.5.8.7 Report S_{max} to the nearest 0.05 mm (0.002 in).



**Concave Edge
Figure 3-11**



**Convex Edge
Figure 3-12**

3.8.5.9 Squareness

Note: Specimen must conform to length, width, and straightness tolerances prior to proceeding.

3.8.5.9.1 Place the specimen, decorative layer up, on the flat horizontal surface.

3.8.5.9.2 Measure the decorative surface of the specimen from one corner to the opposing corner and again for the remaining corners to obtain two diagonal measurements (Q_1 and Q_2) as shown in Figure 3-13.

3.8.5.9.3 Obtain the maximum absolute value (Q_{dif}) of the difference of the two diagonal measurements as demonstrated by $Q_{dif} = |Q_1 - Q_2|$ for each of the tested specimens.

3.8.5.9.4 Report Q_{max} as the maximum Q_{dif} value to the nearest 0.05 mm (0.002 in).

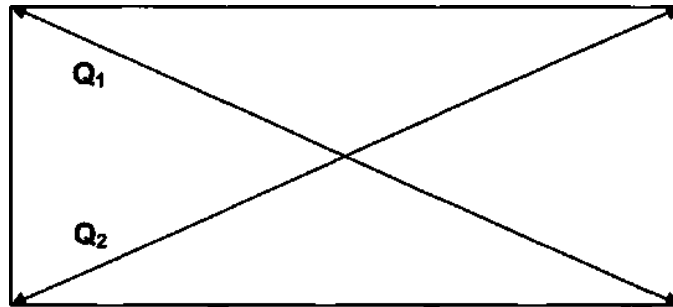


Figure 3-13

3.8.6 Report

3.8.6.1 Reference to this standard.

3.8.6.2 Description of the material under test.

3.8.6.3 Dimensional characteristics as determined by the appropriate section.

3.8.6.4 Any deviation from the specified test method.

3.8.6.5 Date of the test.

3.8.7 Precision & Bias

3.8.7.1 Test method precision and bias have not been established.

3.9 CASTOR CHAIR RESISTANCE

3.9.1 Scope

The test specifies a method for determining the change of appearance and stability of a laminate floor, including joints, under the movement of a castor chair.

3.9.2 Test Apparatus

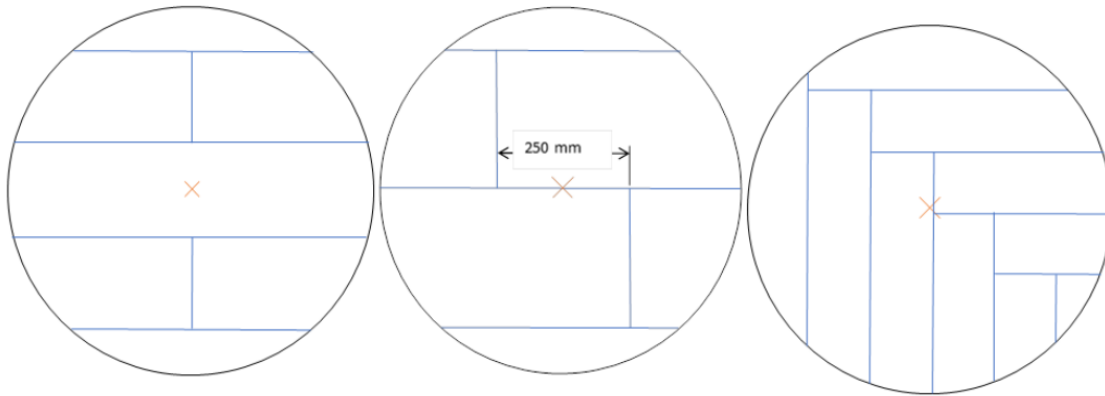
- 3.9.2.1 Castor chair apparatus - Feingerate Baumberg Model Rollstuhltestgerat Type 28167 or equivalent as described in ISO 4918 paragraph 5, with weights installed to provide 90kg (198 lbs.) load.
- 3.9.2.2 The 3 castors shall be single-wheel 50 mm $\pm$ 2.0 mm diameter and 20 mm $\pm$ 2.0 mm wide, with a radius of curvature, R, of castor tread: 130mm $\pm$ 5mm and crank distance: 32 mm $\pm$ 2 mm. The wheel shall be made of polyamide with a surface hardness Shore A hardness of 95 $\pm$ 5 shore A.
- 3.9.2.3 For product with no attached pad, manufacturer's underlayment or CERTIFIED to NALFA LF-03 tier 1 underlayment with a thickness of 2.0mm $\pm$ /- 0.5mm (0.080in $\pm$ /- 0.02in) shall be used
- 3.9.2.4 Conditioned environment maintained at 23°C $\pm$ 3°C (73°F $\pm$ 5°F) and 50% $\pm$ 5% RH.
- 3.9.2.5 Denatured alcohol.
- 3.9.2.6 Clean, soft cloth.

3.9.3 Specimens

- 3.9.3.1 Specimens shall be circular with a diameter of 750 mm (29.5 in) x the nominal thickness of the material and shall include at least one longitudinal and one horizontal joint located in the test area of the castors. See example of installation patterns on Figure 3.14 for different specimens' width. For Herringbone pattern installation, the 750mm diameter do not allow to test the full "W" pattern, only one "V" shape pattern can tested. So if the locking system is exactly the same for all the planks, the product need to be tested 2 times. One time with the long side tongue facing inward the "V" shape and one time with the long side tongue facing outward the "V" shape. Joints spacing in the specimen shall be 250mm or treated according to the manufacturer's instructions
- 3.9.3.2 Specimen shall be tested over manufacturer's recommended underlayment, or CERTIFIED to NALFA LF-03 tier 1 underlayment with a thickness of 2.0mm $\pm$ /- 0.5mm (0.080in $\pm$ /- 0.02in) shall be used

3.9.4 Procedure

- 3.9.4.1 Condition the samples for at least 48 hours prior to the test at a temperature of 23°C $\pm$ 3°C (73°F $\pm$ 5°F) and a relative humidity of 50% $\pm$ 5%.
- 3.9.4.2 Clean the castors with a soft cloth and alcohol. Inspect and replace if necessary.
- 3.9.4.3 Mount the specimen on the platform over the underlayment (Figure 3.14) if not pre-attached to the product already. Tape or bind edges of samples to make sure board slide does not occur during test without applying too much pressure on the edges that could create the center of the tested area to lift up (Photo 3.2).
- 3.9.4.4 Lower the castor base to the surface of the specimen and load weights. Adjust the vacuum head to remove debris.
- 3.9.4.5 Preset the counter for 25,000 or 35,000 revolutions, as required and turn on the apparatus.
- 3.9.4.6 At the end of the test remove the castor base and examine the specimen with standard lighting and viewing distances/angles. Record any damage such as delamination, opening of seams, ledging or crazing (cracking). Changes in gloss or sheen are not considered damage and should be ignored.



A: Specimens of 5" to 8" wide

B: Specimens of 9" TO 10" wide

C: Herringbone installation
(only one "V" pattern)

Figure 3-14



Photo 3.2

3.9.5 Report

- 3.9.5.1 Reference to this standard.
- 3.9.5.2 Description of the material under test.
- 3.9.5.3 List the nature of observable damage and the number of revolutions conducted
- 3.9.5.4 Any deviation from the specified test method.
- 3.9.5.5 Date of the test.

3.9.6 Precision & Bias

- 3.9.6.1 Test method precision and bias have not been established.

3.10 SURFACE BOND

3.10.1 Scope

This test measures the force required to delaminate or split away the surface of laminate flooring

3.10.2 Test Apparatus

- 3.10.2.1 A device to produce a groove in the specimen
- 3.10.2.2 A barbell or mushroom shaped test pad having a base diameter of $35.6 \text{ mm} \pm 0.1 \text{ mm}$ ($1.4 \text{ in} \pm 0.005 \text{ in}$). See Figure 3 - 10 for example. Pad must be sufficiently strong as to not distort under test load parameters.
- 3.10.2.3 Test Frame with $38.0 \pm 0.1 \text{ mm}$ ($1.5 \text{ in} \pm 0.005 \text{ in}$) hole. See Figure 4-3 Test frame must be sufficiently strong as to not distort under test load parameters.
- 3.10.2.4 Tensile Testing Apparatus, capable of holding the Surface Bond Test Frame and having adequate movement and load capability to pull samples apart.
- 3.10.2.5 Grip fixture sized to fit test pad (See Figure 3-15 and Photo 3-5) and fitted with gimbal or universal joint.



Figure 3-15

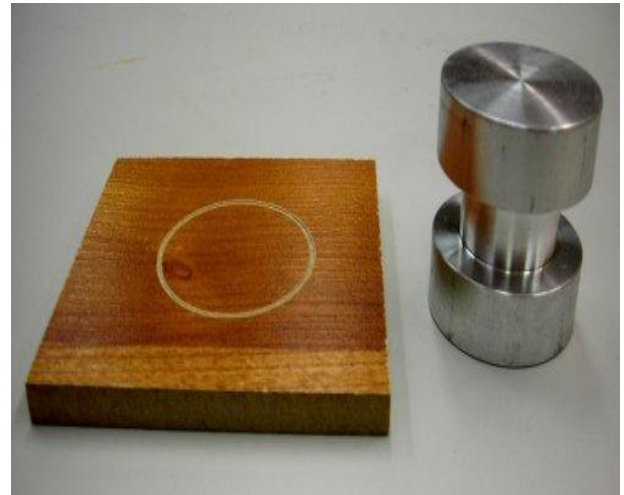


Photo 3-3

Figure 3-15 shows metric values. To convert mm value to inches, multiply the value shown by 0.03937.



Photo 3-4

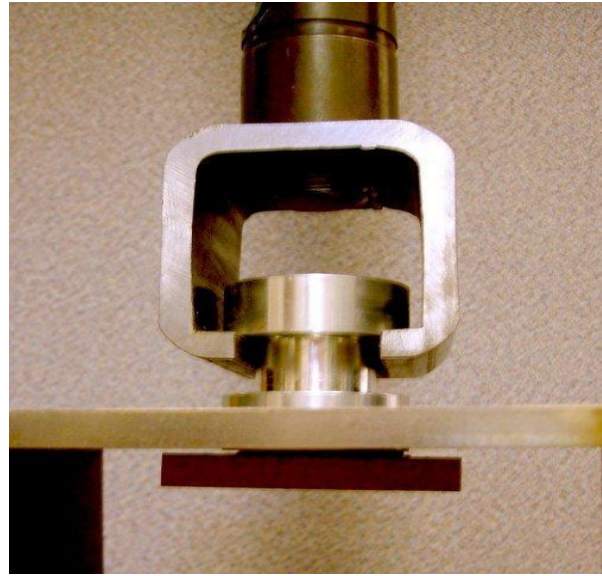


Photo 3-5

3.10.3 Specimens

- 3.10.3.1 For each test, take four specimens from the product to be tested. No two specimens shall be selected from the same plank or tile.

3.10.4 Procedure

- 3.10.4.1 Cut specimen to size: 50mm x 50 mm X nominal thickness (2 in X 2 in X Nominal Thickness).
- 3.10.4.2 Using the grooving devic, prepare specimens in accordance to Photo 3-3. Circular groove cut into the specimen face shall be through the decorative face and 0.0 - 0.3mm (0.012 in) into the core and should give a raised circular test area having a 35.7 ± 2 mm ($1.4 \text{ in} \pm 0.1 \text{ in}$) diameter. This will give a nominal 1000 sq mm (1.55 sq-in) test area.
- 3.10.4.3 Using a hot melt adhesive, with melting point below 150 Deg C, (300 Deg F), or other adhesive that would suitably replace the need for a hot melt adhesive, spread a thin layer of adhesive across the face of the heated pad.
- 3.10.4.4 Carefully place the pad with hot adhesive onto the face of the specimen making sure the pad is centered on the test area.
- 3.10.4.5 Lightly weight or hold pad in place until adhesive has cooled (Apply nominal 0.1 - 0.2 N/sq-mm force loading) (15 psi).
- 3.10.4.6 After the adhesive has cooled and hardened, place the mounted sample into the test frame. See Photo 3-5.
- 3.10.4.7 Using Tensile Tester, apply a constant speed so that failure or delamination occurs within 30 - 90 seconds.
- 3.10.4.8 Record force at failure and where the location of failure occurred i.e. within the coating, within the glue line, between the coating and the core, within the core, etc. If partial split, describe rough percentage attributable to each failure mode.
- 3.10.4.9 If glue line failure occurs, reject the value unless above the prescribed specification criteria.
- 3.10.4.10 If an individual surface bond value varies more than 0.4 N/mm^2 (60 psi) from the average repeat the test using another set of specimens.

Note 1: If the specimen tested is thinner than 15mm (0.59 in), the test pieces shall be strengthened by bonding a 50mm x 50mm (2 in X 2 in) steel plate of at least 10mm (0.39 in) to the underside.

Note 2: To obtain sufficient bonding to the decorative surface layer it may be necessary to sandpaper the surface with a coarse-grained abrasive paper.

3.10.5 Calculations

- 3.10.5.1 Individual Surface Bond Value (SB_n) = Maximum Force (Newtons)/Area (mm) in order to cause a determination or splitting away of the top surface of the laminate product.
- 3.10.5.2 The reported Surface Bond value is the average. It is determined by taking the four individual Surface Bond values and calculating the average.
- 3.10.5.3 Average Surface Bond Value = (SB1 + SB2 + SB3 + SB4)/4.

3.10.6 Report

- 3.10.6.1 Reference to this standard.
- 3.10.6.2 Description of the material under test.
- 3.10.6.3 Surface bond measurement.
- 3.10.6.4 Report failure location.
- 3.10.6.5 Any deviation from the specified test method.
- 3.10.6.6 Date of the test.
- 3.10.6.7 Who performed the testing.

3.10.7 Precision & Bias

- 3.10.7.1 Test method precision and bias have not been established. Repeatability measurements gave a repeatability sigma of 0.6 N/mm² (88.6 psi) for a 99.73 % confidence level.

3.11 FORMALDEHYDE

3.11.1 Content Documentation

A condition of compliance to LF-01 specification is that the laminate manufacturer shall provide documentation to demonstrate compliance of their laminate flooring to applicable Federal (US EPA TSCA Title VI^{***}) and State (CARB – California Air Resources Board) and Canadian CANFER (Formaldehyde Emissions from Composite Wood Products Regulations (SOR/2021-148)) regulations pertaining to residual formaldehyde content

3.11.2 Certification and Compliance

If a supplier provides authenticated verification (see Paragraph 4.2.2) that the core panels purchased for the manufacture of a finished laminate flooring product comply with paragraph 3.11.1, no additional testing is required for the finished laminate flooring—provided that material "finishing" involves only the use of printed decor and other layers that are not considered to be wood composite layers.

***** US EPA – TSCA (United States Environmental Protection Agency - Toxic Substance and Control Act) www.epa.gov/formaldehyde**

3.12 FLATNESS -- (*fw*) and (*fi*)

3.12.1 Scope

This test method is used to determine the dimensional variance for a laminate flooring specimen(s) for width flatness (*fw*) and length flatness (*fi*) when measured on a test surface of suitable size that is rigid and flat.

3.12.2 Test Apparatus

Apparatus for measuring width flatness consisting of a dial gauge accurate to ± 0.01 mm with a rounded tip of radius ≤ 5.5 mm, installed centrally in relation to the support feet. The supports shall be adjustable along the gauge support assembly to provide the required apparatus for measuring width flatness. The measurement d shall not be less than the width w of the test specimen minus 10 mm. The tip of the gauge in contact with the face of the test specimen shall apply a force of (1.0 ± 0.5) N. The mass of the apparatus shall not affect the flatness of the test specimen beyond the limit of the accuracy of the gauge. The instrument shall be set to zero against a suitable reference plate. See Figure 3-16 for illustration.

3.12.3 Adjustment and calibration of the measuring apparatus

On the apparatus for measuring width flatness adjust the support bars or feet according to the width of the test specimen to be evaluated. The measurement d shall be adjusted not be less than the width w of the test specimen minus 10 mm, i.e. $d \geq w - 10$ mm. See Figure 3-16. Use an appropriate caliper gauge and measure the d value. Record the d value to the nearest 0.5mm (0.020 in.). The apparatus shall be set to, or verified to, zero against the flat smooth reference plate (i.e. granite block, steel plate) before each measurement.

3.12.4 Procedure for measuring Width Flatness(*fw*) –

For each of the 5 specimens, place the specimen with the surface layer up, on the test surface. Place the adjusted and zeroed apparatus for measuring width flatness on the specimen as shown in Figure 3-16. Find and determine the maximum deviation for each specimen. No force, but the mass of the measurement apparatus gauge, shall affect the flatness of the test specimen, when the measurement is taken. The maximum deviation can be either positive (+ or concave) or negative (- or convex) and shall be recorded as measurements are taken. Measure values along with its sign (“+” for downward curl or “-” for upward curl), to the nearest 0.01 mm (0.0005 in).

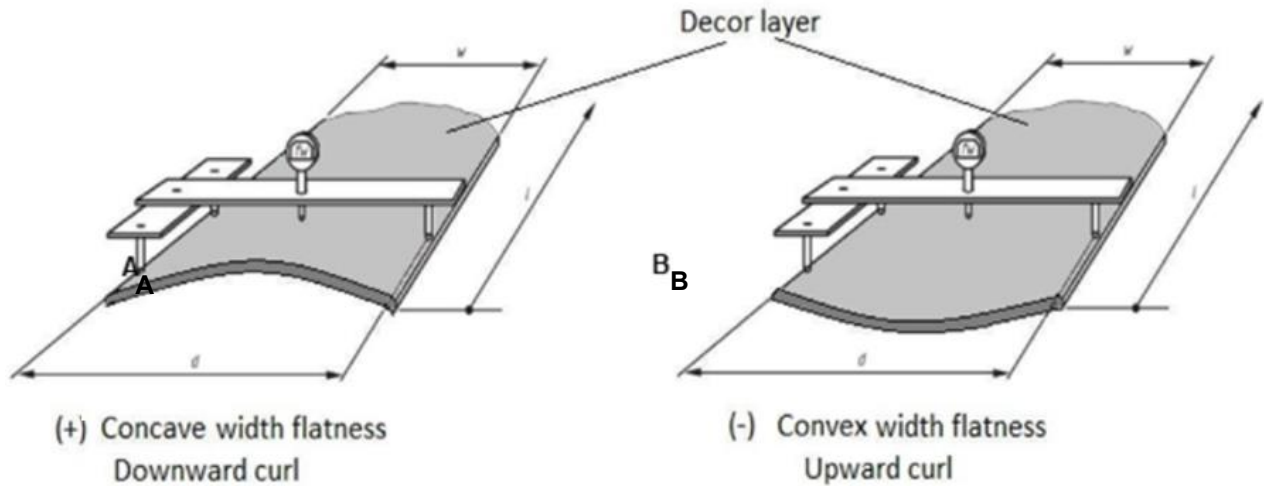


Figure 3-16 — Determination of width flatness (f_w)

3.12.5 Procedure for measuring Length flatness (f_l):

For each of the 5 specimens, place the test specimen firmly against the steel rule as shown in Figure 3-17. If a gap is visible, insert a thickness gauge of successive thickness leaves into the gap at the maximum deviation until the largest thickness leaf that will fit without force into the gap is found. This value is the maximum deviation f_l . If necessary, use the caliper gauge instead. The measured value shall be expressed as negative when the surface layer has a concave shape (Figure 3-17 A) and as positive when the surface layer has a convex shape (Figure 3-17 B). Record all 5 measured values, with its sign, with the result achieved from the appropriate thickness gauge.

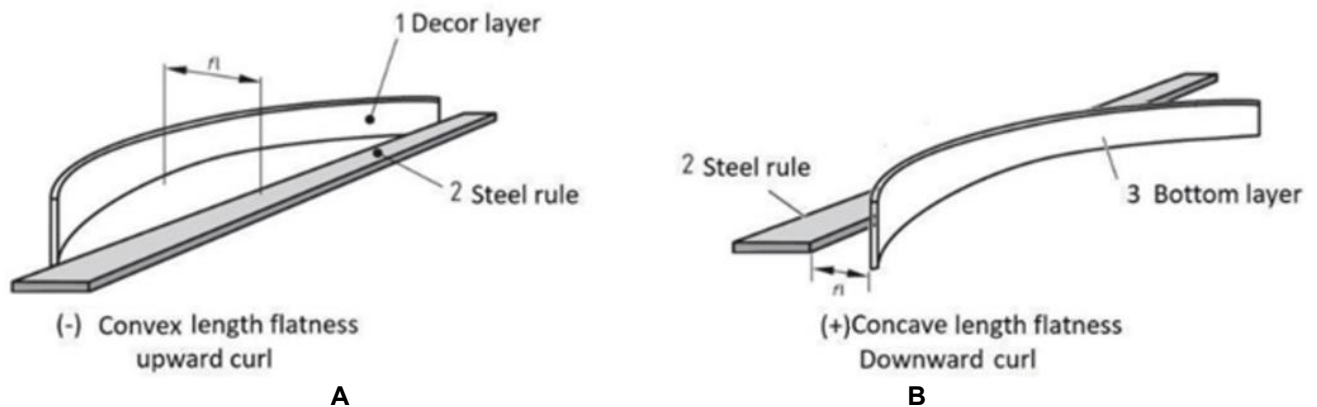


Figure 3-17 — Determination of length flatness (f_l)

3.12.6 Calculation f_w and f_l

Record all 5 measured values, with its sign, with the result achieved from the appropriate thickness gauge. The maximum deviation can be either positive (+ or concave) or negative (- or convex) and shall be recorded as measurements are taken. Measure values along with its sign ("-" for upward curl or "+" for downward curl), to the nearest 0.01 mm (0.0005 in). In addition, recording the maximum deviation also calculates the deviation % by dividing the maximum deviation by "d" and record. Express the result (f_w) and (f_l) along with its sign, in percentage to the nearest 0,01 %.

3.12.7 Test report

The test report shall contain at least the following information:

- Reference to this standard
- Description of the material being tested
- Date tested
- Any deviations from recommended test procedure
- Test results see example test reporting form
- Operator who performed the test

Width flatness f_w mm	-0.12	-0.13	-0.12	-0.11	0.06
"d", mm	192.50				
$f_w \pm \max / d$ %	0.03%				
$f_w -\max / d$ %	-0.07%				
Length flatness f_l	0.20	0.25	0.25	0.30	0.20
l nominal	1200				
$f_l \pm \max / l$ nom %	0.03%				
$f_l -\max / l$ nom %	0.00%				

Table 3-6

3.12.8 Precision and Bias

Test method precision and bias have not been established.

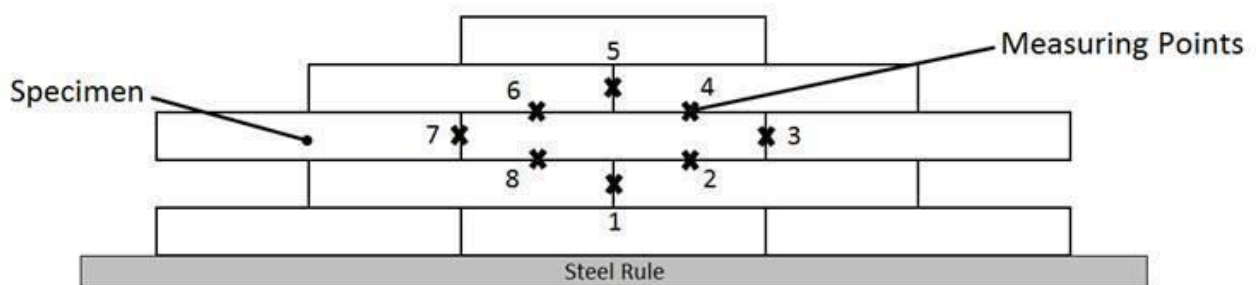
3.13 OPENINGS -- Determination of openings between elements "o"

3.13.1 Scope

3.13.2 Test apparatus

3.13.3 Procedure

Assembling -- By hand force, without using any glue, against the steel rule as a guide, firmly assemble eleven elements taken as specimens, on the test surface as shown in Figure 3-18. The alignment of the individual elements shall be ensured within ± 5 mm (0.200 in). No difference shall be made whether the joint design is of a glue-less mechanical type, or of a design to be glued or by any other means held together. Glue shall in any case NOT be used for this assembly. This test is performed with the elements dry assembled.



1 – 8 "X" Spot for measuring location of Opening "o"

Figure 3-18 — Test assembly for openings between elements, at the 8 measuring points

3.13.4 Measuring

Using thickness gauges or an optical comparator, measure the openings, without applying any force to the elements, at the 8 indicated points in Figure 3-18. Record all 8 measured values with the result achieved from the appropriate thickness gauge or from comparator value.

3.13.5 Calculations

Using the 8 measured values o , calculate the mean value $o_{average}$. Record the maximum individual value o_{max} . Express the results in millimeters to the nearest 0,05 mm (0.002 in).

3.13.6 Report

The test report shall contain at least the following information:

- Laminate product name
- Date tested
- Any deviations from recommended test procedure
- Test results see example test reporting form (Table 3-7)

Openings o	0.05	0.00	0.00	0.05	0.05	0.00
o_{avg}	0.00					
o_{max}	0.05					

Table 3-7

3.13.7 Precision and Bias

Test method precision and bias have not been established.

3.14 LEDGING - Determination of height difference between elements (h) sometimes referred to as overwood

3.14.1 Scope

3.14.2 Test Apparatus

3.14.3 Procedure

Assembling - Use the same specimens as described in paragraph 3.13.3 for measuring height difference. Verify that specimens were assembled and checked to have been assembled as detailed in paragraph 3.13.3 The test assembly with the measuring points locations is illustrated in Figure 3-19.

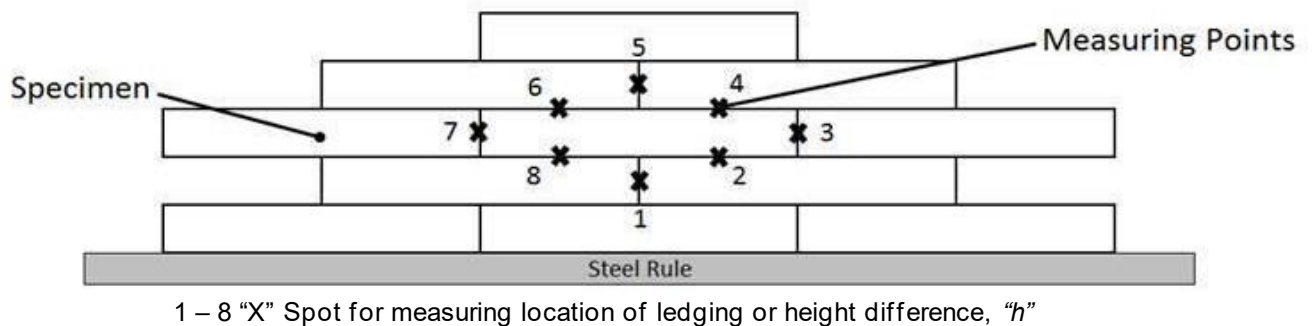


Figure 3-19 — Test assembly for ledging or height difference (“ h ”) between elements, with the 8 measuring points indicated

3.14.4 Measuring

Using a caliper or depth gauge, measure the height differences, without applying any force to the elements, at the 8 indicated points. Place the base of the instrument at one side of the joint and measure the maximum height difference at the other side of the joint. Do not carry out the measurement further than 6 mm (0.25 in) from the joint edge. Record all 8 measured values to the nearest 0.05 mm (0.002 in)

3.14.5 Calculations

Record all 8 measured values to the nearest 0.05 mm (0.002 in), calculate the mean value $H_{average}$. Record the maximum individual value h_{MAX} . Express the results in millimeters (mm) to the nearest 0.05 mm.

3.14.6 Report

The test report shall contain at least the following information:

- Laminate product name
- Date tested
- Any deviations from recommended test procedure
- Test results see example test reporting form

Height difference, h	0.00	0.00	0.02	0.00	0.00	0.00
h_{avg}	0.00					
h_{max}	0.02					

Table 3-8

3.14.7 Precision and Bias

Test method precision and bias have not been established.

Section 4 THIRD PARTY CERTIFICATION

4.1 COMPLIANCE

When reference is made to this standard in statements of compliance, the laminate product shall meet all of the requirements in their entirety. Any laminate flooring product marked or labeled as being compliant with this standard shall meet all the requirements of this standard and shall be certified.

4.2 CERTIFICATION

4.2.1 All physical properties require certification and that testing shall be performed by an independent testing lab. Compliant flooring shall be labeled with the appropriate NALFA/ANSI mark and shall be listed. A party seeking certification shall submit its results, as well as identifying information from the test lab, to NALFA for review and verification. Laminate flooring must undergo third party testing at least every five years or whenever a product is substantially changed. See NALFA.com for more detail about NALFA certification process.

4.2.2 For formaldehyde compliance, applicable certification must be done through an independent, accredited certification organization that has been approved by and issued a current accreditation by a signatory to the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC, 2000) for ISO 65 product certification. Approval by a governmental organization with wood composite product formaldehyde emission standards, that otherwise meets all the requirements of this section, shall meet the independent, accredited certification organization requirements of this standard.

4.3 EFFECTIVE DATE

The certification requirements shall become effective six months after the publication date of this standard.

Appendix A

Supplemental Physical Properties

This appendix is not part of the ANSI/NALFA requirements for laminate flooring but is included for informational purposes only.

Macro-Scratch Resistance	NALFA Macro-Scratch- Standard Test Method for resistance to deep, easily visible surface scratches Access via website (nalfa.com) under Standards and Test Methods section
Surface Swell-Assembled Joint	NALFA Surface Swell- Standard Test Method for resistance to swelling due to surface moisture Can receive NALFA Water Resistance certification upon meeting test criteria Access via website (nalfa.com) under Standards and Test Methods section
Locking strength	ISO 24334 (Laminate floor coverings. Determination of locking strength for mechanically assembled panels)
Slip Resistance	ASTM D 2394 (Standard Methods for Simulated Service Testing of Wood and Wood-Based Finish Flooring) 33 -Coefficient of Friction
Environmental (PPM)	ASTM E 1333 - Standard Test Method for Determining Formaldehyde Levels from Wood Products Under Defined Test Conditions Using a Large Chamber
Sound	ASTM E 90 STC - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions ASTM E 413 - Classification for Rating Sound Insulation ASTM E 492 IIC - Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine
Fire Behavior	ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
Thermal Conductivity	ASTM C 518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmissions Properties by Means of the Heat Flow Meter Apparatus
Auto Ignition	ASTM D 1929 - Standard Test Method for Ignition Properties of Plastics
Light Reflectance: Luminance	ASTM E 284 - Standard Terminology of Appearance
Accelerated Aging & Moisture Content	ASTM D 1037 - Test Methods for Evaluating Properties of Wood-Base fiber and Particle Panel Materials

Table A-1

Appendix B

Supplemental Methodology

This appendix is not part of the ANSI/NALFA requirements for laminate flooring but is included for informational purposes only.

Moisture Content

- 1.0 Scope
 - The test measures the moisture content of laminate flooring.
- 1.1 Method Addendum
 - The test method shall conform to ASTM D 1037 in Sections 119 through 120 with additional criteria:
 - 1.1.1 Sample size shall consist of two specimens with a size of 75 mm x 75 mm (3 in x 3 in) with smoothly and squarely trimmed edges collected from opposite ends of a sample.
 - 1.1.2 Specimens shall not be preconditioned.
 - 1.1.3 Weigh specimen and place in oven $103^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($217^{\circ}\text{F} \pm 4^{\circ}\text{F}$) for 48 hours.
 - 1.1.4 Reweigh specimen directly after removal from oven.
 - 1.1.5 Calculate moisture content per Section 120.1.
- 1.2 Test Report
 - 1.2.1 Average moisture content of the two specimens.

Light Reflectance (Luminance)

- 2.0 Scope
 - This test measures light reflectance based on the definition of Luminance Factor of laminate flooring.
- 2.1 Method Addendum
 - The definition shall conform to ASTM E 284 using the following methodology.
 - 2.1.1 Luminance Factor is defined as the tristimulus value Y.
 - 2.1.2 Values are to be determined by Hunter Lab ColorQuest II® Spectrophotometer or equivalent using CIE system guidelines with cool white fluorescent illuminate, 10-degree observer, spectral reflection included.
- 2.2 Test Report
 - 2.2.1 Calculated Tristimulus value Y shall be reported.

Appendix C

Test Laboratories

This appendix is not part of the ANSI/NALFA requirements for laminate flooring but is included for informational purposes only.

Certain entities have indicated an ability to perform at least portions of the tests outlined within this standard. NALFA assumes no responsibility for these groups and reference to them here is simply as a service to the user. Each should be contacted to verify their ability to perform required testing as well as the cost involved. For a list of applicable laboratories, contact NALFA at (202) 785-9500 or visit the website at www.nalfa.com for an updated listing.