

UNDERLAYMENT PAD SPECIFICATIONS AND TEST METHODS



North American Laminate Flooring Association

NALFA Standards Publication UL 01-2008

UNDERLAYMENT PAD

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 a tiered, minimum performance set of requirements for underlayment pads using standard test methods. Such performance requirements include but are not limited to Impact Sound, Airborne Sound Transmission, Compression Deflection, Thickness, and Moisture Vapor Transmission. The requirements of this standard apply to underlayment pads not attached to laminate flooring.

The procedures and criteria within this standard provide evaluation guidance regarding underlayment products to meet various performance requirements. As testing capability improves, it is recognized that equivalent test methods may be considered.

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 2008 publication for Underlayment Pads, effort has been made to relate this Standard closely to the expected performance in application. During underlayment and 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:

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Section 1 GENERAL

1.1 SCOPE

This standard is intended to establish the minimum requirements that a non-attached underlayment pad must meet to achieve the NALFA Seal of Approval. The first tier establishes the minimum requirements. The second tier builds on that by adding moisture resistance properties.

Materials meeting the requirements of the first tier only, do not provide moisture resistance to the laminate flooring installation and would have to be provided separately, if required.

1.2 REFERENCED TEST METHODS

ASTM E492 Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine.
ASTM E989 Standard Classification for Determination of Impact Insulation Class (IIC)
ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E413 Classification for Rating Sound Insulation
ASTM D3575 Standard Test Methods for Flexible Cellular Materials Made From Olefin Polymers
ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials
ASTM F1249 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

1.3 CONDITIONING

Materials to be evaluated shall follow the conditioning requirements of each ASTM Test Standard, unless noted in this document. If noted, this document supersedes the ASTM conditioning requirements.

1.4 DEFINITIONS

- 1.4.1 Underlayment Pad: A product used over the sub-floor or underlayment surface and under the laminate flooring material for the purpose of improving properties such as smoothing out minor sub-floor imperfections; improving acoustic and thermal insulation properties; reducing walking fatigue; etc.
- 1.4.2 Backer: A material bonded to the back of the laminate core layer sometimes referred to as the substrate layer
- 1.4.3 Décor Layer: The layer of laminate flooring providing visual aesthetic properties.
- 1.4.4 Laminate Flooring: A rigid floor covering with a surface layer consisting of one or more thin sheets of a fibrous material (usually paper), impregnated with aminoplastic thermosetting resins (usually melamine), pressed or bonded on a substrate, normally finished with a backer.
- 1.4.5 Substrate: The core material of the laminate flooring.

Section 2
PERFORMANCE PROPERTIES AND VALUES

Method	Requirement
Tier I	
Acoustical 3.1 ASTM E 492, Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine	≥ 50 dB
3.2 ASTM E 90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements	≥ 50 dB
Compression Resistance 3.3 ASTM D 3575 Suffix D, Test Methods for Flexible Cellular Materials Made From Olefin Polymers	≥ 21 kPa @ 0.5 mm of Deflection (≥ 3 psi @ 0.020" of Deflection)
Thickness 3.4 ASTM-D3575, Test Methods for Flexible Cellular Materials Made From Olefin Polymers	≥ 1 mm (≥ 0.040")
Tier II	
3.5 ASTM E 96 Water Method, Water Vapor Transmission Rate Or ASTM F1249 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor	3lb/1000 ft ² d at 100 degrees Fahrenheit, 90% RH or 1.5 kg/100m ² d at 37.8 degrees Celsius, 90% RH

Section 3 Test Methods

3.1 Impact Sound Transmission, ASTM E 492

3.1.1 Scope

3.1.1.1 This test method covers the laboratory measurement of impact sound transmission of floor (laminated floor with underlayment pads)-ceiling assemblies using a standardized tapping machine. A laminated floor that is a nominal 8 mm thick shall be used.

3.1.2 Test Apparatus

3.1.2.1 As described in ASTM E 492.

3.1.3 Specimen

3.1.3.1 Underlayment is to be tested at nominal thickness and area that is appropriate for the testing room.

3.1.4 Procedure

3.1.4.1 As outlined in ASTM E 492. The client shall request that the testing be performed with a 152 mm (6") thick reinforced concrete slab. In addition a 12.5 to 15.9 mm (0.5 to 0.625") thick gypsum board suspended ceiling with 89 to 100 mm (3.5 to 4") of lay in fiberglass insulation or sound attenuation batts shall be used.

3.1.5 Calculations/Classification

3.1.5.1 Results of ASTM E 492 are classified according to ASTM E989.

3.1.6 Report

The report shall include the following

3.1.6.1 Reference to this standard.

3.1.6.2 Results

3.1.6.3 Description of the material tested.

3.1.6.4 Description of the test room used with ASTM E492.

3.1.6.5 Any deviations from the specified methods.

3.1.6.6 Date of the test.

3.1.7 Precision & Bias

3.1.7.1 Precision & Bias of this test method is fully discussed in Paragraph 11.1 through 11.3 of ASTM E 492.

3.2 Airborne Sound Transmission, ASTM E90

3.2.1 Scope

3.2.1.1 This test method covers the laboratory measurement of airborne sound transmission loss of building partitions such as walls of all kinds, operable partitions, floor (laminated floor with underlayment pad)-ceiling assemblies, doors, windows, roofs, panels, and other space-dividing elements. A laminated floor that is a nominal 8 mm thick shall be used.

3.2.2 Test Apparatus

3.2.2.1 As described in ASTM E 90.

3.2.3 Specimen

3.2.3.1 Underlayment is to be tested at nominal thickness and area that is appropriate for the testing room.

3.2.4 Procedure

3.2.4.1 As described in ASTM E 90. The client shall request that the testing be performed with a 152 mm (6") thick reinforced concrete slab. In addition a 12.5 to 15.9 mm (0.5 to 0.625") thick gypsum board suspended ceiling with 89 to 100 mm (3.5 to 4") of lay in fiberglass insulation or sound attenuation batts shall be used.

3.2.4.2 As described in ASTM E 90 and as an alternative to the floor/ceiling assembly described in 3.2.4.1 a joist floor/ceiling system as described below may be used. A 37.5 mm (1.5") lightweight concrete topping over a 15.9 mm (0.625") tongue and groove plywood subfloor, nailed floor joists 24" on center. The ceiling shall consist of 15.9 mm (0.625") gypsum board. The channels shall be filled with 139.7 mm (5.5") of cellulose insulation.

3.2.5 Calculation/Classification

3.2.5.1 Results of ASTM E 90 are classified according to ASTM E413.

3.2.6 Report

The report shall include the following

3.2.6.1 Reference to this standard.

3.2.6.2 Results

3.2.6.3 Description of the material tested.

3.2.6.4 Description of the test room used with ASTM E90.

3.2.6.5 Any deviations from the specified methods.

3.2.6.6 Date of the test.

3.2.7 Precision & Bias

3.2.7.1 Precision & Bias of this test method is fully discussed in Paragraph 14.1 and 14.2 ASTM E 90.

3.3 Compression Resistance

3.3.1 Scope

3.3.1.1 This test method covers the measurement of the force necessary to compress an underlayment to 0.5 mm (0.020 in.) of deflection.

3.3.2 Test Apparatus

3.3.2.1 An apparatus shall be provided having a flat compression foot, larger than the specimen to be tested, connected to force-measuring device and mounted in a manner such that the underlayment pad can be compressed at a speed of 12.5 mm/min (0.5 in./min). The apparatus shall be arranged to support the underlayment pad on a level horizontal plate.

3.3.3 Specimens

- 3.3.3.1 The underlayment pad shall be a right cylinder with parallel top and bottom surfaces. The thickness shall be no greater than 75% of the minimum top dimension.
- 3.3.3.2 Underlayment pads shall be a minimum of 2500 mm² (4 in.²) in area and shall be the same nominal thickness as supplied to the marketplace. The underlayment pad may not be plied up. Three samples for each product shall be tested.

3.3.4 Procedure

- 3.3.4.1 Place the underlayment pad centered in the line of the axial load of the supporting plate of the apparatus.
- 3.3.4.2 Bring the compression foot into contact with the underlayment pad, applying a total pretest pressure of 758 ± 69 Pa (0.11 ± 0.01 psi) for cellular products and 1551 ± 172 Pa (0.225 ± 0.025 psi) for non-cellular products. Compress the underlayment pad a distance of 0.5 mm (0.020in.). Record the load at this point.

3.3.5 Calculations

- 3.3.5.1 Calculate the deflection force at 0.5mm (0.020 in.) of deflection, per unit area of underlayment pad, expressed as kilopascals (or pounds-force per square inch) as follows:

$$CD = \frac{F}{A}$$

Where:

- CD = compression deflection force at 0.5 mm (0.020 in.) of Deflection in kPa (psi).
- F = force required to compress the underlayment pad to 0.5 mm (0.020in.).
- A = test area on the underlayment pad, m² (in.²).

3.3.6 Report

The report shall include the following;

- 3.3.6.1 Reference to this standard
- 3.3.6.2 Average result of three specimens tested.
- 3.3.6.3 Description of the underlayment pad tested.
- 3.3.6.4 Any deviations from this method.
- 3.3.6.5 Date of test.

3.3.7 Precision & Bias

- 3.3.7.1 Precision and Bias has not been established for this test method.

3.4 Thickness

3.4.1 Scope

- 3.4.1.1 This test measures the thickness of an underlayment pad.

3.4.2 Test Apparatus

- 3.4.2.1 A dial gauge or other suitable measuring device capable of providing accurate and reliable readings within a range of ± 0.025 mm (0.001in.). The minimum foot area shall be 650
- 3.4.2.2 Sq-mm (1 sq-in.). Pressure on the foot shall be 190 ± 50 Pa (0.028 ± 0.007 psi).

3.4.3 Specimens

3.4.3.1 Randomly selected representative samples of underlayment pads shall be used.

3.4.4 Procedure

3.4.4.1 Measure the center and four equally spaced locations around the center of the underlayment pad.

3.4.5 Calculations

3.4.5.1 Average the five locations.

3.4.6 Report

The report shall include the following

3.4.6.1 Reference to this standard

3.4.6.2 The average result.

3.4.6.3 Description of the underlayment pad.

3.4.6.4 Any deviations from the test method.

3.4.6.5 Date of test.

3.4.7 Precision & Bias

3.4.7.1 The precision and bias of this test has not been determined.

3.5 Water Vapor Transmission Test

3.5.1 Scope

3.5.1.1 This test method covers the determination of water vapor transmission (WVT) of underlayment pads. The test method is limited to specimens not over 32mm (1-1/4 in) thick. There are two methods within ASTM E96, the Water Method shall be used it provides for the measurement of permeance, and two variations include service conditions with one side wetted and service conditions with low humidity on one side and high humidity on the other.

3.5.1.2 A second test method may be chosen ASTM F1249. This method is applicable to sheets and films up to 3 mm (0.1 in.) in thickness, consisting of single or multilayer synthetic or natural polymers and foils, including coated materials. It provides for the determination of (1) water vapor transmission rate (WVTR), (2) the permeance of the film to water vapor, and (3) for homogeneous materials, water vapor permeability coefficient. Note 1 Values for water vapor permeance and water vapor permeability must be used with caution. The inverse relationship of WVTR to thickness and the direct relationship of WVTR to the partial pressure differential of water vapor may not always apply.

3.5.2 Test Apparatus

3.5.2.1 The apparatus detailed in section 6 of ASTM E96 shall be used.

3.5.2.2 Or the apparatus detailed in Section 6 of ASTM F1249 shall be used.

3.5.3 Specimens

3.5.3.1 The specimens shall be prepared as detailed in Section 9 of ASTM E96.

3.5.3.2 Or as detailed in Section 10 of ASTM F1249.

3.5.4 Procedure

3.5.4.1 The procedure for the water method, Section 12 of ASTM E96 shall be followed.

3.5.4.2 Or as detailed in Section 10 of ASTM F1249.

3.5.5 Calculations

3.5.5.1 The calculations, as detailed in Section 13 of ASTM E96 shall be followed.

3.5.5.2 Or as detailed in Section 11 of ASTM F1249.

3.5.6 Report

The report shall include the following:

3.5.6.1 Reference to this standard.

3.5.6.2 ASTM Test method used.

3.5.6.3 Results in lbs/1000 sq. ft. x day or kg/100m² x day

3.5.6.4 Description of the underlayment Pad.

3.5.6.5 Test Temperature – Must be 100 degrees Fahrenheit or 37.8 degrees Celsius.

3.5.6.6 Relative Humidity in the test Chamber – Must be 90% RH

3.5.7 Precision & Bias

3.5.7.1 The precision and bias of ASTM E96 is detailed in Section 15.

3.5.7.2 The precision and bias of ASTM F1259 is detailed in Section 13.

Section 4

THIRD PARTY CERTIFICATION

4.1 COMPLIANCE

When reference is made to this standard in statements of compliance, the Tier level must be included, the underlayment product shall meet all of the requirements of the claimed Tier in their entirety. Any underlayment marked or labeled as being compliant with any Tier of this standard shall meet all of the requirements of that Tier and shall be certified.

4.2 CERTIFICATION

All Certification and testing shall be performed by an independent testing lab. A party seeking certification shall submit its results, as well as identifying information for the test lab, to NALFA for review and verification. Underlayment Pads must undergo third party testing at least every five years or whenever a product is substantially changed.

4.3 EFFECTIVE DATE

The certification requirements shall become effective with the publication date of this standard.

Appendix A

Glossary

This appendix is not part of the NALFA requirements for underlayment pads but is included for informational purposes only.

1. Acclimation: Adaptation of the laminate floor to its installation environment.
2. Acoustical Properties: Absorbance, reflection or transmission of sound waves.
3. Adhesion: A chemical process by which two materials can be joined together.
4. Antistatic: Ability to limit the accumulation of static electricity on a surface.
5. Backer: A material bonded to the back of the substrate.
6. Balanced Construction: A panel construction that has materials of similar properties bonded to both sides of the panel.
7. Bond: Adhesion.
8. Chemical Resistance: The degree to which a material resists visual or physical degradation from exposure to various household and/or industrial chemicals.
9. Colorfastness: The ability of a material to retain its original color upon exposure to light or other source of degradation (i.e., light resistance).
10. Compact Laminate: High Pressure Laminate greater than or equal to 2 mm (0.08 in) in thickness.
11. Continuous Press Laminate (CPL): A manufacturing process where the laminate is formed on a continuous double-belted press.
12. Continuous Laminate Flooring: A product created by permanently bonding a continuous press laminate to a core.
13. Core: The center of a panel (e.g., surface layer, core, and backer).
14. Crook: A specific type of warp when a panel has a curvature from end to end, edgewise, from a straight line (i.e., banana).
15. Crowning: A specific type of warp when a panel assumes the shape of an inverted "U" along the length or width dimensions of the face (i.e., convex).
16. Cupping: A specific type of warp where a panel assumes the shapes of a "U" along the length or width dimensions of the face (i.e. concave).
17. Décor Layer: The layer of laminate flooring providing visual aesthetic properties.
18. Deflection: The bending of a material between supports when a load is applied.
19. Delaminating: Separation of the panel's layer(s).
20. Density: Unit weight per volume of a panel expressed in lb/ft³ or kg/m³.
21. Depression: A dent in the surface of a panel.
22. Dimensional Stability: The ability of a material to resist changes in measured dimensions caused by environmental factors (e.g., moisture or temperature).
23. Direct Laminate Flooring: A product where resin impregnated material layer(s) is permanently bonded to the core.
24. Direct Press Laminate (DPL): A laminating process by where the wear layer and décor surface are bonded directly to the substrate in a single step.
25. Embossing: A process by which the surface of the panel is given a texture.
26. Equilibrium Moisture Content: The moisture content at which the material neither gains nor loses moisture at a given relative humidity.
27. Expansion Gap: A space necessary between fixed objects (i.e. walls of a room, pipes, and cabinets) and between the material itself to allow for the movement of the material.
28. Fiberboard: A core material primarily composed of cellulose fibers combined with synthetic resins or other suitable bonding systems under heat and pressure. The materials are usually designated as low, medium, or high density (e.g., MDF or HDF).
29. Flame Spread: Measurement of the flame propagation along the surface of a material.
30. Floating Floor: Installation method by which the flooring panels are connected together and not attached to the subfloor.

31. High Density Fiberboard (HDF): A fiberboard with density greater than 800 kg/m³ (50 lb/ft³).
32. High Pressure Laminate (HPL): A laminating process where materials are consolidated under heat and pressure exceeding 5.17 MPa (750 psi).
33. High-Pressure Laminate Flooring: A product created by permanently bonding high-pressure decorative laminate to a core.
34. Impact Resistance: Ability to resist fracture or damage from a falling object.
35. Inlay: A decorative effect used in flooring by combining elements of the same material but with different colors or patterns (e.g., borders or feature strips).
36. Laminate: A product made by bonding together two or more layers of material.
37. Laminate Flooring: A rigid floor covering with a surface layer consisting of one or more thin sheets of a fibrous material (usually paper), impregnated with amino-plastic thermosetting resins (usually melamine). These sheets are either pressed as such (HPL, CPL, Compact), and in the case of HPL or CPL bonded on a substrate, or in the case of DPL directly pressed on a substrate. The product is normally finished with a backing primarily used as a balancing material. Its performance values are set by the NALFA/ANSI Standard.
38. Medium Density Fiberboard (MDF): A type of core material primarily composed of ligno-cellulosic fibers combined with a synthetic resin or other suitable bonding system and bonded together under heat and pressure.
39. Melamine Resin: A thermosetting resin used in the impregnation process of materials used to make laminate flooring.
40. Moisture Content: The amount of water in the material, usually expressed as a percentage of the dry weight.
41. Moisture Meter: A tool used to measure moisture content.
42. Overlay: A product of paper, plastic, film, metal foil, or other material incorporated into the laminate flooring surface that provides the wear resistance and protection.
43. Panels: Finished sections of the laminate flooring (e.g. planks, tiles, and squares).
44. Particleboard: A core material primarily composed of cellulosic materials (usually wood), generally in the form of discrete pieces or particles, as distinguished from fibers. The cellulosic material is combined with a synthetic resin or other suitable bonding system by a process in which the inter-particle bond is created by the bonding system under heat and pressure.
45. Pattern End Matched: When the ends of the flooring panels, typically similar patterns, are matched end to end to yield a continuous linear effect.
46. Peaking: Areas of the laminate flooring at adjoining panel seams that have risen above the intended horizontal plane of the flooring surface.
47. Plank: A tile approximately five or six times longer than wide.
48. Pressing: A manufacturing process by which material layers are consolidated using pressure.
49. Residual Indentation: The difference between the initial thickness and the final thickness after performing the static load test.
50. Resins: A polymeric material used for impregnating and bonding layers of laminate flooring.
51. Seams: A line or junction where panels are connected together.
52. Stain Resistance: The degree which a material resists permanent discoloration from exposure to household items and/or industrial chemicals.
53. Substrate: The core material of the laminate flooring.
54. Sub-floor: A pre-existing supporting surface in a structure.
55. Surface Layer: The outermost layer of laminate flooring designed to be the visible side when installed (i.e., wear layer).
56. Tile: A panel of geometric shapes (e.g., squares, rectangles, etc).
57. Thermofusing: A process where resins are consolidated under heat and pressure to create a permanent bond.
58. Thermosetting Resins: Resins that cure by chemical reaction to form bonds and do not melt when exposed to heat.
59. Underlayment: A material used between the laminate flooring and the subfloor (e.g., foam padding).
60. Warp: Crowning, cupping, or crook.
61. Wear Resistance: Ability of the laminate flooring surface to resist wear through its décor layer.
62. Wear Layer: Surface layer.

Appendix B

Test Laboratories

This appendix is not part of the NALFA requirements for underlayment pads 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 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.