

Specifications, Product Testing and Terminology

The following synopsis provides a review of various material and final product testing, which is performed on our products, as well as, many of our competitors.

Frequently, we experience a situation where confusion results from the lack of familiarity or inaccurate interpretation of terminology, product testing, and product specifications. This document was developed with the intent to provide a "laymen's" knowledge of the technical and/or analytical aspects of product testing and terminology and its significance to our products.

Specifications:

Rubber Floor Tiles:

ASTM developed F-1344 Standard Specification for Rubber Floor Tiles in 1991, which replaced the old Federal Specification #SS-T-312b. These standards provide dimensional and performance criteria for product acceptability.

The ASTM F-1344 permits a thickness tolerance of +.015"/- .005" for pattern tile and +/-.005" for smooth.

The F-1344 permits a hardness not less than 85 when tested in accordance with ASTM D-2240 Durometer (Hardness).

In addition to dimensional tolerances, the standard provides performance requirements in the areas of static load limit, resistance to short-term chemical resistance, resistance to heat, and abrasion resistance.

All Johnsonite rubber tiles meet the dimensional and performance criteria of the specification.

Solid Vinyl Floor Tiles:

ASTM F-1700, Standard Specification for Solid Vinyl Floor Tiles provides dimensional and performance criteria for product acceptability. Due to the wide variety of solid vinyl floor tiles currently available on the market, the Specification's classification structure includes the following classes and types:

Class I - Monolithic;

Type A - Smooth Surface or Type B - Embossed Surface.

Class II - Surface Decorated; Type A - Smooth Surface or Type B - Embossed Surface.

Class III - Printed Film; Type A - Smooth Surface or Type B - Embossed Surface.

The specification provides dimensional tolerances for size of ± -0.016 " (0.4 mm) for 12" x 12" (30.5 mm x 30.5 mm) tiles and a thickness tolerance of ± -0.05 " (0.13 mm).

The specification also includes requirements for flexibility, residual indentation, chemical resistance, squareness, and dimensional stability.

Johnsonite Safety Stride Solid Vinyl Floor Tiles are Class I, Type B products and conform to the requirements of this specification.

Rubber and Vinyl Stair Treads:

ASTM developed F-2169 Standard Specification for Resilient Stair Treads in 2002, which replaces the old Federal Specification RR-T-650.

The new ASTM specification provides for three types of materials:

Type TS - Rubber, Thermoset

Type TP - Rubber, Thermoplastic

Type TV - Vinyl, Thermoplastic

The standard requires that the products have a durometer hardness of not less than 85 and meet Resistance to Short-term Chemical and Resistance to Heat requirements.

The dimensions and thickness of the treads are the manufacturer's standard or as specified in the order.

Depth tolerances shall be $\pm -1/8$ " and a thickness tolerance of $\pm -1/32$ " are permitted.

All Johnsonite rubber and vinyl treads meet the dimensional criteria of the specification.

Rubber and Vinyl Wall Base:

Federal Specification SS-W-40a, was cancelled by the General Services Administration in October of 1995. It has been replaced by ASTM F-1861, Standard Specification for Resilient Wall Base which is a dimensional and material performance specification.

The new ASTM specification provides for three types of materials:

Type TS - Rubber, Thermoset

Type TP - Rubber, Thermoplastic

Type TV - Vinyl, Thermoplastic

Wall base height tolerance is 1% the nominal height of the wall base. The thickness tolerance for .080 gauge wall base is + .015"/- .005" and for .125" (1/8") is +/- .015". (Note: Johnsonite manufactures .080 gauge wall base to +/- .005" and 1/8" to + .005"/- .015".)

The length of the wall base cannot be less than as specified on the package. The angle of the cut can be 90 +/-5 degrees.

The material must pass tests for flexibility, resistance to staining and light aging, chemicals, and dimensional stability.

Johnsonite Rubber and Vinyl Wall Base meets the dimensional and material performance criteria of the specification.

Vinyl Mouldings:

The manufacture of these products is not governed by any known specification. They are specialty products.

Terminology and Product Testing:

Hardness (Durometer): This test is performed to the requirements outlined in ASTM D-2240 and utilizes a hand-held instrument called a "Shore" gauge. The gauge consists of a spring-loaded indentor and has a scale reading from 0 to 100. The indentor is applied to the surface of the test material and the hardness of the material is obtained from the reading on the scale.

The higher the reading, the harder the material.

Hardness testing is used primarily to classify materials and no simple relationship exists between hardness testing and indentation or any fundamental property of the material.

Hardness readings are also used as control measures to ensure that the proper amount of oils and/or plasticizers have been entered into the material formulation. Without these oils and plasticizers, the product can become much stiffer and difficult to manipulate, as in the case of forming wall base corners.

Tensile, Elongation, and Modulus: These tests are performed to the requirements outlined in ASTM D-412 and provide information regarding the elastic properties and uniformity of the material composition. The tests are performed on a pulling apparatus or Instron, utilizing stamped specimens developed from finished products. The test specimen is placed in the machine and the amount of force to pull it apart and eventually break the material is recorded on a chart recorder.

Tensile values are recorded in pounds per square inch of force required to pull the

material until it breaks.

Elongation values are recorded in the percentage of stretch the material can withstand before breaking or in simpler terms, if the specimen is 1" long before testing and breaks at 2", the elongation would be 100%. If 1" long and breaks at 3", the elongation would be 200% and etc.

Modulus values are obtained by determining the pounds force to pull the specimen 100% its pretested length or as required by the specification.

Example: A rubber band requires very little force to pull apart, therefore; its tensile value would be very low, but its elongation would be high, since you can stretch a rubber band several times its original length.

Abrasion Resistance: This test is performed to the requirements, as outlined, in ASTM D-3389 and uses a piece of equipment called a "taber abrader". A 4" x 4" product sample is weighed and then mounted into the machine. The machine is equipped with a motor drive, which abrading wheels are attached. Based on the specification requirements, the abrading wheels are weighted and the machine is cycled for a specific number of cycles.

After the test is completed, the sample is reweighed to determine the amount of material loss on the specimen.

This test is an attempt to determine the wearability of a finished product, but due to the wide range of variables in actual installation environments, there is no direct relationship between the test results and the longevity of a product. The test results can be used to classify and compare similar products only.

The test results are given in grams loss per cycle or revolution. The lower the value, the better the wearability. (Note: Typically the harder the material, the lower the abrasion value. The wearability of a product is contingent on many other test values. i.e.: resiliency, indentation, tensile strength, elongation, and etc.)

Indentation: This test is performed to the requirements, as outlined, in ASTM F-1914 Standard Test Method for Short Term and Residual Indentation of Resilient Floor Covering and provides a reference to the resiliency of a product and reported in the percentage of mass loss or compressive state of the product after testing.

The test is performed with actual production specimens. The specimens are mounted into the test apparatus and a weighted load is applied to the surface of the specimen. The load is mounted atop a 1/4" diameter foot, which contacts the specimen. The load is applied for 10 minutes and then removed and the depth of the depression is measured to determine the initial indentation of the material. The specimen is measured again 1 hour later to determine the residual indentation or the material's capability to recover from a load.

These values typically relate to dynamic loading such as a high heel shoe applied to the product's surface and its ability to recover from the load.

The lower the residual indentation percentage value, the better resiliency of the product.

Static Load Limit: This test is performed to the requirements, as outlined, in ASTM F-970 and was developed to determine the resiliency of a product when subjected to heavy loads and the product's capability to recover when the load is removed.

The thickness of an actual production sample is measured and then a weighted 1-1/8" diameter spherical foot is placed on the product's surface for a determined amount of time. The amount of weight and time is determined by the specific product specification.

The 1-1/8" diameter spherical foot is typical of most commercial furniture, appliances, and machinery found in many commercial and residential environments.

When the test time requirement is satisfied, the load is removed and the product is allowed to relax for a period of twenty-four (24) hours. After the relaxation period, the product thickness is once again measured where the foot made contact to the product surface. The difference between the initial thickness of the product and the thickness after the test provides the total amount of permanent indentation the product has incurred as a result of the testing.

Most of the specifications developed for rubber and vinyl flooring products have adopted an 125 pound load for a period of one (1) hour as the criteria for the test. This load would represent a piece of furniture or an appliance with a total weight of 500 pounds based on the assumption that the furniture or appliance is supported with four (4) feet.

Coefficient of Friction: The federal and industry standard for testing coefficient of friction or the slip resistance of a surface is tested to the requirements, as outlined, in ASTM D-2047, which utilizes a friction measurement machine, commonly referred to as the James Machine.

The test utilizes a shoe sole grade leather material attached to a weighted plate. The leather material is pulled across the surface of the specimen and the friction resistance is recorded on a graph.

The test procedure is designed for determining "dry" coefficient of friction measurements only, but many manufacturers perform the tests by applying a mist of water to the specimen surface and obtain "wet" friction values for their products. Due to the wide range of probable variation due to the lack of any specifics relating to water application to the specimen surface, the "wet" values should be considered only as reference values.

Most manufacturers involved with the ASTM Resilient Flooring subcommittees, responsible for developing flooring specifications and test procedures, have adopted this procedure (D-2047) when reporting coefficient of friction results for their respective

products.

The Federal Standard for flooring materials and floor finishes is 0.5. This value of not less than 0.5 meets the requirements for compliance to Rule 5 on "The use of terms slip retardant, slip resistant, or terms of similar import," of the Proposed Trade Practice Rules for the Floor Wax and Floor Polish Industry as issued by the Federal Trade Commission on March 17, 1953.

These specifications relate to Johnsonite's rubber, vinyl and linoleum sheet and tiles, stair treads and vinyl moldings.

Fire and Smoke Product Testing:

Critical Radiant Heat Flux: This test procedure was developed for testing the resistance of flooring materials to support a flame and is tested to the requirements, as outlined, in ASTM E-648. The test is performed with actual product samples. The test specimen, measuring 10" wide by 41-1/2" long, is glued to a reinforced concrete board and placed in the testing apparatus. The radiant heating panel is positioned at an angle of approximately 45 degrees to the specimen. The specimen is exposed to radiant heat for a specified time and the amount of wattage is calculated to determine how much radiant heat is required to produce a flame on the material. The test is performed three (3) times and the average of the tests are used for reporting critical radiant heat flux of a material in watts per square centimeter.

Class I applications require a minimum of 0.45 watts/sq. cm. and Class II require 0.22 watts/sq. cm.

The higher the wattage value, the more heat and time required for the sample to support a flame.

All of Johnsonite's rubber and vinyl tiles, rubber stair treads, vinyl stair treads and nosings exceed the requirements for Class I installations.

Flame Spread Index per ASTM E-84 (Steiner Tunnel Flame Test): This test is for determining the burning characteristics of wall and ceiling materials. Unfortunately, many specifiers confuse this requirement with the ASTM E-648 Critical Radiant Heat Flux test for Interior Floor Finishes. The Steiner Tunnel Flame Test (ASTM E-84) is only required for Interior Wall and Ceiling Materials.

Due to the number of incorrect product specifications, the federal government developed a task group in 1997, in conjunction with the GSA, DOD, AIA and many other military and civilian specifying organizations, to eliminate any reference of this test requirement in Interior Floor Finish specifications.

The test procedure utilizes actual production samples, measuring 24" wide by 24' long,

are glued to a reinforced concrete board and suspended from the ceiling of the tunnel chamber. The samples are exposed to a high-intensity flame, similar to a blow torch, for a specified time.

If the samples ignite, the flame duration and smoke generated is monitored and calculated into a flame spread index and smoke developed index.

The classification of products is as follows: Class "A" = Flame Index of 0 to 25 Class "B" = Flame Index of 26 to 75 Class "C" = Flame Index of 76 to 200 All classes must have a smoke developed index less than 450.

Johnsonite hopes this document has provided the information and clarification required to assist in proper product selection, but if additional information is required, please contact your local Johnsonite distributor or Johnsonite Customer Service at 1-800-899-8916 for additional assistance.