

Solid Surface Properties and Applications

This document is a complementary document to *ANSI/ICPA SS-1-2001, Performance Standard for Solid Surface Materials*. It is intended to serve as a reference guide and as an educational tool for producers, distributors, architects, engineers, contractors, home builders, code authorities and users to promote understanding of the possible applications of solid surface materials. Its purpose is to describe many of the applications where solid surface is used and to provide an understanding of what “solid surface” means. It is for educational purposes only and it is NOT TO BE USED as a specification document.

A panel of industry experts, representing all major trade associations, familiar with solid surface manufacturing and performance worked for two years compiling this document so fabricators, specifiers, architects and consumers can better understand and appreciate solid surfacing and the many places where it has applicability.

Solid surface is a common term applied to a small range of materials, characterized by a distinctive look and feel, that can have different chemical compositions or thicknesses yet share many functional similarities. The panel agreed on the following definition:

“Solid surface materials are manufactured from polymeric materials. Granules may also be added to enhance the color effects. Solid surface materials are non-porous and homogeneous, with the same composition throughout the thickness of the solid surface material. They are capable of being repaired, renewed to the original finish and fabricated into continuous surfaces with inconspicuous seams.” Solid surface materials meet the requirements of ANSI/ICPA SS-1-2001.

The second part of this definition is the critical part for consumers and designers because it describes the features of solid surface that make it unique from other materials. The polymeric resin materials used for producing solid surface materials are 1) Filled Acrylic Polymers, 2) Filled Polyester Polymers and 3) Filled Acrylic-Polyester Blend Polymers. The filler most often used is Alumina Trihydrate (ATH).

The industry panel sought to provide definitions for many of the performance characteristics of solid surface materials in order to help the consumer better understand what they are purchasing and allow them to ask about performance properties that are important for their specific application. Every consumer should be aware of reported test results and the tests used to determine those results. Those terms and definitions are listed below.

Ability to be polished – describes whether and to what degree the material can be finished.

Values range between a matte finish and a high gloss (0-60). Higher numbers indicate a higher gloss on the specific part.

Bacterial - fungal resistance – tests the material’s ability to inhibit the growth of bacteria and fungus. See ASTM G 21 and G 22.

Barcol Hardness – a scale that defines hardness compared to similar materials. Higher readings indicate higher degrees of hardness. See ASTM D 2583. A high reading above the typical range could indicate a brittle material. A low reading could indicate under cured material. SOLID SURFACE materials have Barcol readings, typically, between 45 and 65.

Color stability – describes how the color changes over time. The lower the color change the better it is. See ANSI/ICPA SS-1-2001 and NEMA LD 3.3 for examples of test conditions.

FDA approved – The FDA tests individual final products to determine if any hazardous chemicals can be extracted from the part. If the extractable materials are lower than the FDA guidelines, which demonstrate the non-adulteration of food, then the FDA can approve or list the part for a specific use. Please consult directly with the FDA or any regulatory agency on the specifics of their procedures and protocols.

FDA compliant – If all materials used to make a solid surface product are listed in Title 21 of the Code of Federal Regulations then the material is said to contain only FDA Compliant ingredients. This is a less rigorous standard than FDA Approved.

Flexural Modulus – describes the stiffness, a measure of the resistance to deformation under load, of the material with a high number indicating greater stiffness. A low Flex Modulus indicates a material that bends easily and one that requires more support. A high number

indicates a material that may not be forgiving enough to be flat on an imperfect surface. See ASTM D 760 for specifics. A load test can indicate performance along the same lines as the Flex Modulus. A load test applies the force over a larger area of the test specimen and is more representative of most actual use conditions. A wide range of Flex Modulus values are appropriate for Solid surface as long as it is accounted for in the design of the installation. Creep describes the long-term behavior of the material under constant load. Creep resistance is important for structural members.

Flexural Strength – describes the amount of force required to bend and break the material when a specific thickness, test piece is bent. This is sometimes called the load sustained at failure. A test piece is supported at both ends, a force is applied to a small, concentrated area in the center and the force and amount of bending is measured. See ASTM D 760 for specifics.

High temperature resistance - describes the ability of the material to retain its integrity when exposed to high temperature (365 °F). Glass Transition Temperature (Tg) is another measure of high temperature resistance that describes the temperature at which the material softens. Higher temperatures indicate the material will need to be heated more before it deforms.

Home chemical resistance – describes how the material maintains its integrity when exposed to typical household chemicals. Any change to the surface must be repairable back to the original finish to attain a passing rating. Repairable is defined in ANSI/ICPA SS-1-2001 Section 7.

Impact resistance – describes the resistance of the material to being chipped or broken by an impact on a small area of the material. See ASTM D 256 or NEMA LD 3.

Laboratory chemical resistance– describes how the material maintains its integrity when exposed to laboratory chemicals. Any change to the surface must be repairable back to the original finish to attain a passing rating. Resistance to specific chemicals not covered by ANSI/ICPA SS-1 2001 should be evaluated to attain approximate performance prior to use by exposing the surface to the specific chemical of interest in the same manner as described in ANSI/ICPA SS-1 2001.

Scratch resistance – describes the amount of force necessary to scratch the material.

Stain resistance – describes how ten household materials (covered and uncovered) can initially leave a mark on the surface and how much effort is required to remove the mark. The best performance is when all of the staining materials can be easily removed. The ANSI test result is the total of the score on each household material and the result does not discriminate between or among the individual stain results. Higher values indicate that more effort was required to remove the stains. The maximum passing value is 64. Any combination of the 20 values totaling 64 or less yields a passing score. 20 scores of 3 passes as does 10 scores of 1 and 10 scores of 5. Any stains not removable by sanding 0.005 in. of the solid surface automatically generate a failure in the test. See ANSI/ICPA SS-1-2001 for specifics of the test method.

Surface conductivity – describes a test of the electrical resistance or conductivity of the material. It is related to the dissipation of static electricity from the surface.

Thermal Expansion – describes how much the material expands upon warming and contracts upon cooling. A wide range of Coefficient of Linear Thermal Expansion (CLTE) values is appropriate for solid surface as long as the expansion and contraction is known and accounted for in the design and engineering of the installation.

UV weathering stability – describes how the color and the surface appearance change as the material is exposed to ultraviolet light. This is an accelerated test that subjects the part to significantly more intense radiation than it is exposed to in the real world. Test results may not accurately represent actual use results. See NEMA LD 3.3 and ASTM D 2565 for examples of test conditions.

Water resistance - is a test that determines the ability of the material to withstand repeated exposure to water. There are two separate ways this is reported. First, as a water absorption rate over a specific time period, where a lower number means that less water soaked into the solid surface. Second, it describes the material's ability to maintain its appearance and integrity over a range of temperatures. ANSI has established different temperature ranges for different applications. 70°F to 190°F and 50°F to 150°F are typical ranges. This hot and cold cycling test is often referred to as Thermal Shock Resistance.

Wear resistance – describes the resistance to being worn away during continuous exposure to brushes. Intended to show long-term resistance to cleaning, scrubbing and use with

respect to maintaining the initial gloss surface appearance of the solid surface part. See ANSI Z124.6.5 and NEMA LD 3.3 for specific test methods.

Solid surface materials have many applications. Some applications are harsher than others while others rely on different attributes of solid surface materials to provide the performance benefit needed for the application. Some of the more common applications are listed below.

One application area is Countertop applications, e.g. flat surfaces in commercial, residential, industrial, and medical areas and cook top areas. The *minimum* performance standard for these applications is detailed in the ANSI/ICPA SS-1-2001 standard. A second area is a Bathware fixture such as: vanity tops, sinks, bathtubs, spas, shower floors and shower surrounds. These applications as well as kitchen sinks, bar sinks and washbasins must meet the requirements of the applicable ANSI Z 124 Standards. A third group of miscellaneous applications includes window sills, floor tiles, stair treads, lighting housing and other electrical applications, wall cladding, partitions, work stations, interior and exterior facades.

The industry panel ranked the importance of the various attributes of solid surface materials on a scale of 1-14 in each of the applications listed above. Any attribute receiving a score of 10 or higher is very important to that particular application.

For the Countertop and Bathware applications the important properties are covered by the respective ANSI Standards with the exception of bacterial - fungal resistance, which is not covered by the Standards. Bacterial - fungal resistance was rated as an 11 by the panel. Solid surface materials hardness, void free and seamless properties make bacterial - fungal resistance a key benefit of its use.

COUNTERTOPS: The important properties for countertop applications are: stain resistance, wear resistance, impact resistance, heat resistance, hardness, flexural strength (ability to flex without cracking), thermal expansion, color stability, water resistance, home chemical resistance, flexural modulus (stiffness), and bacterial – fungal resistance. For medical application countertops all of the same properties are important with greater emphasis paid to the bacterial – fungal resistance of the material and the performance of the material with respect to non-

household chemicals that may be present in specific medical areas. Testing of chemical agents known to be present in the application area should be done prior to installation.

BATHWARE: The important properties for the Bathware applications which includes kitchen sinks as well as bathroom sinks, vanity tops, showers, tubs, spas, and surrounds are: water resistance, thermal shock, impact resistance, home chemical resistance, stain resistance, flexural strength, color stability, hardness, wear resistance, bacterial – fungal resistance, flexural modulus and thermal expansion. Flexural strength is especially important in bathtubs and spas because of the amount of stress placed on the bottom by people standing in them and on the sides by water. It is also important in kitchen sinks because of stress put on the sink by the garbage disposal. Stain resistance is very important in kitchen sink applications because of the high profile a stain would have in a kitchen sink and because of the wide range of acidic or staining foods that are put in the sink like pasta sauce, tea and cooking oil. Heat resistance and thermal shock are properties that are important to kitchen sinks, bathroom vanity tops, bathtubs and spas because of the temperature extremes that these parts can experience during their lifetime.

WINDOW SILLS require all of the properties of countertop applications with the addition of UV light stability and with a special emphasis placed on color stability and water resistance because this application is highly impacted by these performance properties. Knowing the thermal expansion properties so the part can be sized correctly is also critical.

FLOOR TILES and *STAIR TREADS* have similar important properties to countertop application with several key exceptions. Heat resistance and flexural modulus are not nearly as important as wear and impact resistance and thermal expansion. Impact and wear resistance are important in a high traffic application with the potential for items being dropped on the surface. Thermal expansion is very important because of the need for proper, long term fit of the tiles.

FURNITURE and *WORKSTATIONS* are similar to countertop applications although not as demanding in some ways. Color stability, hardness, impact resistance, wear resistance, stain resistance, flexural strength, thermal expansion and water resistance are still important but chemical resistance, heat resistance, flexural modulus and bacterial – fungal resistance are not quite as important. This is primarily due to the decreased amount of use these applications see compared to other countertop applications.

For *WALL CLADDING* and *PARTITIONS* the important properties to evaluate are flexural strength, impact resistance, color stability and thermal expansion. Flexural strength and impact

resistance are important because walls are easily bumped or leaned against. It is important to understand thermal expansion to ensure proper fit and finish of the wall.

For *INTERIOR ARCHITECTURAL FACADES*, thermal expansion, flexural strength, color stability, impact resistance, stain resistance, hardness and wear resistance are the more important attributes to evaluate to ensure that the façade retains its original, appearance, shape and color for as long as possible.

For *EXTERIOR ARCHITECTURAL* features and lighting fixtures, color stability and UV weathering stability are the most important features followed closely by thermal expansion, heat resistance, impact resistance, flexural modulus, water resistance, hardness and flexural strength.

THIS DOCUMENT DOES NOT CONTAIN ALL OF THE APPLICATIONS FOR SOLID SURFACE MATERIALS. THE BEAUTY OF SOLID SURFACE MATERIALS IS THAT IF YOU CAN IMAGINE IT YOU CAN PROBABLY CREATE IT.

###