

ANSI/UL 723 (ASTM E84) “TEST FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS” AND FLAMMABILITY RATINGS

Fire Protection Codes and Classification

The basic goal of fire protection codes and standards is to reduce risks associated with fires. There are private and public organizations concerned with developing, instituting and maintaining fire protection regulations, and as a result, there are many differing building regulations, test methods or procedures for material evaluation as well as required approvals for commercial and, in some cases, residential applications.

All colors and thicknesses of Zodiaq® quartz surfaces carry the highest “Interior Finishes” rating, Class I (Class A), of the principal U.S. building codes:

- Life Safety Code, NFPA 101 Section 10.2.3 Interior Wall or Ceiling Finish Testing and Classification
- Uniform Building Code (UBC) (issued by ICBO) Section 4204, Table 42-A
- Basic Building Code (issued by BOCA) Section 922.5.3
- Standard Building Code (issued by SBCCI) Section 704 – Restrictions on Interior Finishes
- HUD Section 405-8.2 and Section 405-8.3 or Table 4-5.4
- HHS Section 8.15:F. Interior Finishes

The United States of America has a federal structure, however building codes and regulations are the responsibility of the individual states through local regulations. Many building authorities utilize the National Fire Protection Association’s “NFPA 101 Code for Safety to Life from Fire in Buildings and Structures” for fire regulation guidance. Examples of regional organizations that have issued regulations are:

- South – Standard Building Code issued by the Southern Building Code Congress International, Inc. (SBCCI)
- West – Uniform Building Code (UBC) issued by the International Conference of Building Officials (ICBO)
- Northeast/Midwest – BOCA National Building Code issued by the Building Officials and Code Administrators International, Inc.

Generally, local authorities favor codes developed by organizations within their region of the United States. Building codes may or may not be adopted in their entirety by the local authority.

One Test – Many Different Names

In the case of “Interior Finishes,” surface burning characteristics determine a material’s flame performance classification under the same test procedure, yet these identical test procedures are referenced differently by the various standards organizations. For example, Underwriters Laboratories Inc. (UL) developed UL 723 (now called ANSI/UL 723) and the American Society for Testing and Materials (ASTM) has adopted this UL test into its own standard as ASTM E84. This industry standard outlines the test procedure for evaluating surface burning characteristics of interior wall finish materials. The National Fire Protection Association (NFPA) standard 255 as well as Universal Building Code standard 42-1 are also based on this same testing. In summary, these four standards are equivalent.

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Interpreting Test Results to Obtain Classification

Material classification of fire performance is based on the test results in accordance with the Life Safety Code, NFPA 101 Section 10.2.3 and the Standard Building Code (issued by SBCCI) Section 704 and/or Uniform Building Code (UBC) (issued by ICBO) Section 4204 and Basic Building Code (issued by BOCA) Section 922.5.3:

Life Safety Code, NFPA 101 Section 6-5.2.1 and Standard Building Code (issued by SBCCI) Section 704

| CLASSIFICATION | FLAME SPREAD INDEX | SMOKE DEVELOPED |
|----------------|--------------------|-----------------|
| Class A | 0 – 25 | < 450 |
| Class B | 26 – 75 | < 450 |
| Class C | 76 – 200 | < 450 |

Uniform Building Code (UBC) (issued by ICBO) Section 4204 and Basic Building Code (issued by BOCA) Section 922.5.3

| CLASSIFICATION | FLAME SPREAD INDEX | SMOKE DEVELOPED |
|----------------|--------------------|-----------------|
| Class I | 0 – 25 | < 450 |
| Class II | 26 – 75 | < 450 |
| Class III | 76 – 200 | < 450 |

Testing

The ANSI/UL 723 (ASTM E84) Surface Burning Characteristics of Building Materials test is typically used to determine the relative surface burning characteristics of materials used as coverings for walls and ceilings. The test requires 24 feet (7.3 m) x 2 feet (0.61 m) of material for a single evaluation and does not assess fire risk potential of material in an actual fire situation. The test provides a means to describe a material's fire and heat response during a controlled burn.

The "Steiner Tunnel" burn chamber is 25 feet (7.6 m) long, 2 feet (0.6 m) wide and 1 foot 9 inches (0.3 m) deep with the walls of the tunnel being lined with insulated firebrick. The test specimen is lowered horizontally into the tunnel and a lid constructed of noncombustible metal and a mineral composite is used to seal the tunnel so that no air enters the chamber during testing.

Gas burners at one end of the tunnel provide a 4.5-foot (1.4 m) flame source for ignition and a blower creates a controlled draft. Heat-resistant observation windows are located at 1-foot intervals along one side of the tunnel so that the entire length of sample can be observed for the duration of the 10-minute test. A photometer is located at the opposite end, or vent end, of the tunnel and is used to indicate changes resulting from effluents, particulates or smoke.

The distance traveled by the flame is used to calculate the Flame Spread Index (FSI). "Flame spread ratings offer a general indication of the speed with which fire might spread across the surface of a material."⁽¹⁾ The amount of smoke generated during the burn is measured optically and is used to calculate the Smoke Developed Index (SDI). "Thus, an interior wall and ceiling finish material with a low smoke development value should provide better visibility in a given egress route than a material with a high smoke development value."⁽²⁾

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Figure I: Exterior view of the Steiner Tunnel apparatus: Underwriters Laboratories Inc., Northbrook Division, Northbrook, Illinois. Tunnel or chamber lid is removed completely for insertion of test material.



Figure II: Exterior view of the Steiner Tunnel apparatus: Underwriters Laboratories Inc., Northbrook Division, Northbrook, Illinois. Tunnel or chamber lid is in place. Operator uses viewing windows along the side of tunnel to quantify flame propagation.

It is key to understand that both the FSI and SDI are required for classification purposes.

Red oak and calcium silicate cement board are used for calibration purposes. Red oak represents a Flame Spread Index of 100 and a Smoke Density Index of 100. Cement board is burned and represents a Flame Spread Index of 0 and a Smoke Density Index of 0.

For all interior finishes, an FSI of less than 25 results in a Class A (Class I) classification or rating **only** provided that the SDI is less than 450. Any material with an SDI of greater than 450 is not classifiable (i.e., it does not meet Class I, II or III ratings regardless of the FSI). In specifying materials, it is key to request the data for both FSI and SDI since it may ultimately differentiate the performance between two materials that both carry a Class I rating.

Note: The ANSI/UL 723 (ASTM E84) standard and test results described herein are intended to show the comparative surface burning characteristics and density of smoke of Zodiaq® solid surfacing sheeting when subjected to standardized controlled fire conditions. Under actual fire conditions, performance of any material evaluated in accordance with ANSI/UL 723 (ASTM E84) may vary significantly, from which the results might otherwise differ due to specific to end-use parameters.

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Zodiaq® Quartz Surfacing Performance

Zodiaq® quartz surfacing has been evaluated in accordance with ANSI/UL Standard 723 “Test for Surface Burning Characteristics of Building Materials” (ASTM E84) by Underwriters Laboratories Inc. — Northbrook Division, Northbrook, Illinois (www.ul.com).

Zodiaq® Quartz Surfaces

| | FLAME SPREAD INDEX (FSI) | SMOKE DEVELOPED INDEX (SDI) | CLASS |
|---------------------------------|--------------------------|-----------------------------|-------|
| 2 cm | <15 | <100 | I (A) |
| 3 cm (For all colors tested) | <10 | <50 | I (A) |

Examples of other building materials fire performance as listed on www.ul.com and classified according to NFPA 101 criteria:

| MATERIAL | FSI | SDI | CLASSIFICATION |
|--|---------|--------|---------------------|
| Mineral board ⁽³⁾ | 0 | 0 | Class I (Class A) |
| Mineral and fiber boards (coated) ⁽⁴⁾ | 20 | 30 | Class I (Class A) |
| Mineral and fiber boards (uncoated) ⁽⁵⁾ | 285–305 | 65 | Not Ratable |
| Plastic Laminate ⁽⁶⁾ | 55 | 85–140 | Class II (Class B) |
| Molded Plastic — open grid panels ⁽⁷⁾ | 165–190 | 500+ | Not Ratable |
| Untreated Veneer Facing ⁽⁸⁾ | 80 | 70 | Class III (Class C) |

^(1,2) *Life Safety Code® Handbook*, 2003 edition

⁽³⁾ *G-P Gypsum Dens-Deck®*

^(4,5) *Masonite FlameSpec*

⁽⁶⁾ *Nevamar unbonded Type PFR1*

⁽⁷⁾ *Paragon Molding — molded plastic panels*

⁽⁸⁾ With treated or untreated backs 1/4 in. or greater, General Veneer Mfg. Co.