BUILDING & CONSTRUCTION INFORMATIONAL BULLETIN

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INTRODUCTION TO ASTM E84 & FREQUENTLY ASKED QUESTIONS

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ASTM E84 (often referred to as just "E84") is the standard test method for assessing the surface burning characteristics of building products. The purpose of this test is to observe the flame spread along a sample in order to determine the relative burning behavior of its material. Through the E84 test, both Flame Spread Index (FSI) and Smoke Developed Index (SDI) are reported for a given sample. FSI is the measurement for the speed at which flames progress across the interior surface of a building, while SDI measures the amount of smoke a sample emits as it burns.

The FSI and SDI indicies are used to establish a scale for the rate at which flame spreads and smoke develops during an E84 test.

For example, reinforced cement board calibration material has an FSI of 0 and an SDI of 0, whereas red oak calibration material has an FSI and SDI of 100.

During the test, the sample is mounted on the ceiling under a removable lid, and a forced draft is provided in order for the movement of air and products of combustion within the tunnel, and to the exhaust/scrubber system.

The progress of the flame is then monitored through viewports on one side of the apparatus and recorded, with software computing the various data points to derive the FSI and SDI. Smoke developed is also measured through the optical density of a light obscuration meter. It should be noted that the 'fuel contributed' measurement is no longer in use.

ASTM E84 Frequently Asked Questions:

When is the E84 test required?

The 2006 International Building Code (IBC) specifies that "interior wall and ceiling finishes shall be classified in accordance with ASTM E84." Additionally, the National Fire Protection Agency (NFPA) 101® Life Safety Code® requires that "Interior wall or ceiling finish that is required elsewhere in this Code to be Class A, Class B, or Class C shall be classified based on test results from NFPA 255, ASTM E-84, or UL 723."

How is the test run?

An E84 test is conducted by placing a 24" wide x 24' long sample into a Steiner Tunnel (see description of Steiner Tunnel below), wherein the test is administered through the use of two burners which provide 89kW of energy.

What is a Steiner Tunnel?

Developed by Albert Steiner in the 1940s, the Steiner Tunnel (pictured) is a steel box lined on its sides and floor with fire brick, and featuring a removable lid. The tunnel contains a 12-in. high fire chamber with two burners at one end providing 89kW of energy. The Steiner Tunnel was adopted as an ASTM Standard in 1950 and given the designation of E84. Equivalent standards are maintained by NFPA and UL as NFPA 255, UL 732, and with certain modifications as CAN/ULC-S102. Under the Canadian standard, additional fire bricks are installed on the floor of the tunnel and the view glass is removed. UL 1256 also references a modified version of the Steiner Tunnel for use on certain roofing systems.

Is certification required?

No, certification is not required for E84 tests. However, because certification is a quality control process that helps to ensure that the product being tested is the product being manufactured, certification can be used as a way to differentiate a product from similar market products. If product certification is involved, the product sampled and tested after certification must not vary wildly from that used for original certification. For more information on building product certification, please visit www.intertek.com/building/certification

What if our product fails? Passes?

ASTM E84 is a comparative test, and as such there is no real "pass" or "fail". The test generates numbers expressed as Flame Spread Index (FSI) and Smoke Developed Index (SDI), and while there are no pass-fail criteria in the standard, certain codes and regulations define required FSI value and/or SDI value for applications and installations. If a sample's values do not meet code directives, the product may be limited or prohibited. In such cases, it may be advisable to run additional tests (perhaps with modified materials) to legitimately improve the product's FSI or SDI.

What are the differences in the US and Canadian versions of the test?

The major difference that distinguishes the US from the Canadian version of the Steiner Tunnel Test is the way in which the sample is mounted in the testing chamber. For US testing, the sample is mounted on the roof of the testing chamber, while the Canadian version requires that certain samples be mounted on the floor, depending upon the composition of the sample, or its intended use.

This is not allowed for US testing as any products mounted on the floor of the tunnel are no longer qualified. Given these variations in the testing, results for a sample will differ between the US and Canada, though both will provide important test data.

The Intertek Solution:

Intertek currently operates four testing laboratories within North America certified to perform ASTM E84 Testing. In addition, our Coquitlam, British Columbia lab specializes in conducting CAN/ULC-S102 testing for the Canadian market. Our services also include testing to IBC, NRCC, and NFPA 101 standards, as well as testing required by overseas nations and specialty groups such as the California State Fire Marshal and USCG. Led by our talented team of engineers and technicians, Intertek's Steiner Tunnels are some of the busiest in the commercial world, and

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Karl Houser, P.E., LEED AP, is the Senior Fire Protection Engineer, Building & Construction, at Intertek, a testing, inspection and certification organization. However, Karl's area of engagement is code consulting and related fire protection services in the Built-environment. As the leader of Intertek project consulting services, Karl is responsible for outreach to architects, code officials, general contractor, building owners and others in the construction community. Karl has over 30 years of experience in the building industry, working to address issues of code compliance, design of fire protection systems, testing/commissioning of fire protection systems, risk assessment and risk management of special hazards, fire protection specific to the Health Care industry, ADSA compliance, and third-party peer review and inspection services.