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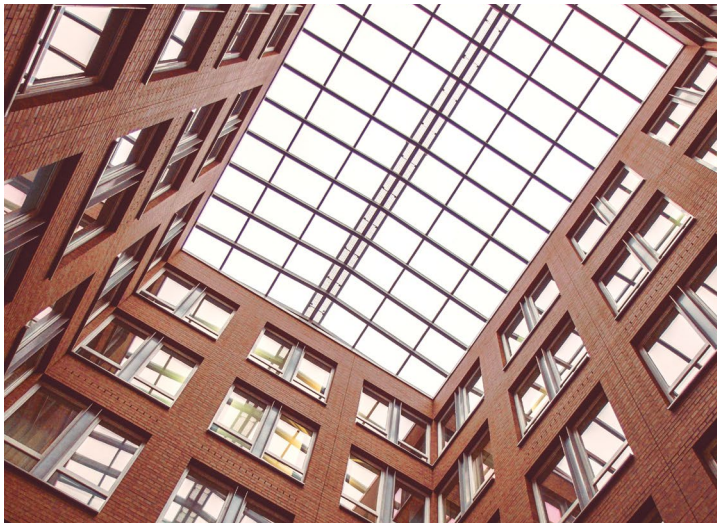
TESTING FOR DOORS

THE ORIGINAL "GREEN" BUILDING MATERIAL: BRICK

SUSTAINABLE DESIGN



TESTING MATTERS

by Ben Dorsey

In the world of building products, performance testing is common.
For product manufacturers, it can be a time-consuming and costly process.
Why would they choose to undertake it? More importantly,
what is the value in such testing to you?

Before we explore these, and related questions, specifically for doors, we need to understand a little more about the testing of building products. It helps to consider this from the perspective of involved parties. Various organizations become involved with sometimes overlapping roles and always within an interrelated model:

- An appropriate organization creates a standard of expected performance.
- A local, regional, or international authority having jurisdiction (AHJ) accepts the standard and makes it part of their building code.
- Architectural-Engineering firms design projects, and related 3-part project specifications, while referencing both codes and standards.
- Other organizations create test specifications to ensure compliance to the standard.
- Independent testing agencies undertake actual product testing per the test specification.
- Manufacturers submit their products to the testing agency (likely after reviewing the requirements and performing internal testing to some extent).

So, the product is tested to a test specification to be considered for compliance to a given industry standard and/or related building code.

Now what does this process mean for you? You want products that meet certain criteria. For example, you might be concerned with how well the product will hold up over the test of time. In support of mandated or voluntary sustainability initiatives, you may want products that can save energy costs or contribute to credit achievement in green building rating systems. You certainly want products that provide for the safety and security of your students, faculty, staff, and visitors.

Meanwhile, the architectural-engineering community that is assisting you will attempt to translate your desired criteria into a project specification that dictates specific performance characteristics for all products that will be used in the project. They will always consider the building codes. As we have seen, these codes will reference certain standards.

Let's explore appropriate standards and associated test specifications for doors and entrance systems as they relate to some of your desired outcomes. These standards and subsequent testing primarily apply to exterior doors or entire entrance systems. Indications of quality or compliance by a given manufacturer should also give you confidence in their interior doors.

Energy Efficiency

The definitive performance standard of energy efficiency for commercial and institutional buildings is known as ASHRAE 90.1. ASHRAE is the American Society of Heating, Refrigerating, and Air-conditioning Engineers. Their 90.1 standard has become an integral part of countless building codes. A portion of the standard deals with the expected energy performance of doors.

One measure of performance is the thermal efficiency of the door. In other words, to what extent does the door exhibit heat loss or heat

gain. High levels of heat loss or gain have a direct bearing on the heating or cooling load of the facility. These systems, as you know, are energy intensive. Therefore, a door that exhibits a lower level of heat loss or gain is more energy efficient.

Heat loss or gain is expressed as a U-factor. U-factor is the reciprocal of R-value (insulating value).

ASHRAE 90.1 calls for U-factors that don't exceed specific levels. The location of your campus matters because the standard establishes U-factors per ASHRAE climate zones. The standard also makes provision for various types of doors such as flush doors or monumental stile and rail doors. The latter would use a good deal of glass.

Finally, the standard references the approved test specification for determining U-factor. This test specification was developed by the National Fenestration Rating Council and is known as NFRC 100.

Therefore, you can look for a published U-factor for doors and verify if the manufacturer used the approved test specification. If so, the manufacturer should be able to provide copies of its test results. Even if you don't wish to deal with these matters directly, your service providers should.

Long-term Reliability

This broad expectation can translate into more specific criteria that relate to door standards. Here, the type of door material is often a factor because various tests are specified depending on the material (hollow metal, wood, fiberglass, aluminum, or composite/hybrid assemblies).

Several organizations establish test specifications in regards to these materials. They consider such factors as the life cycle expectations or endurance, the capability of material to resist dents, the capability of the material to resist UV fading, and more.

Relevant organizations in this general category include the American National Standards Institute (ANSI), ASTM International (formerly American Society for Testing and Materials), and the National Wood Window and Door Association (NWWDA), among others.

Due to the variety of possibilities here, it is best to ask for any test results that relate to overall product reliability. I can best illustrate this point with two examples. First, ANSI A250.4 began as a standard from the Steel Door Institute. Now, as an ANSI standard, it can be applied to any door/frame assembly. The test specification measures the long-term use or endurance of the door assembly in opening/closing cycles. Various criteria describe failures that can occur along the way to a cycle count. This swing test can result in cycle counts of 250,000 (bottom threshold) to over 1,000,000. In fact, some products have achieved cycle counts of several million.

For another example, ASTM G154 and G155 are tests designed to measure the fading of materials that occur due to sunlight exposure. G155 is only designed for non-metallic materials so it is appropriate for wood, fiberglass, and FRP (fiber reinforced polymer) doors. Moisture is also introduced in the testing to fully evaluate product weathering.

Extreme Weather Resistance

Speaking of weathering, we should note that the general term—windstorms—and more specific terms, such as hurricane-rated, describe testing scenarios that put doors through the effects of weather extremes.

Here, local building codes and local jurisdictions have created standards and test specifications for products, including doors, that are used within their jurisdictions. Because these standards are so high, a product found compliant here will certainly hold up to the rigors of weather elsewhere.

Two jurisdictions are noteworthy: (a) The Florida Building Code, established by the Florida Building Commission, demands a high level of product performance, especially in what it calls its High Velocity Hurricane Zone (Miami-Dade, Broward, and coastal Palm Beach counties); (b) The Texas Department of Insurance has also established similar standards and its own set of tests. These jurisdictions also influence other building codes.

In hurricane, and other windstorm-prone regions, three factors influence the performance of exterior doors:

- Impact resistance (due to windborne debris)
- Air pressure changes
- Water infiltration

Thus, testing of doors for these criteria becomes essential for peace of mind.

However, there is a note of caution here. Such testing considers specific sizes of doors as well as specific hardware and glazing. Therefore, no blanket statement of compliance can be made for every potential door configuration. Additionally, unless you are using the particular arrangement of door and hardware, the manufacturer cannot legally label the product as compliant to the given standard.

Sound Control

This particular characteristic is equally applicable to exterior and interior doors but will usually be more important for interior doors. You will hear terms such as sound isolation, sound transmission, and acoustical doors used in this context. For sound that is generated on one side of a door, the general goal is to keep sound within that space as much as is reasonably possible and to attenuate it on the other side.

The primary test specification for sound control is known as ASTM E90. It describes how to measure airborne sound transmission loss of building partitions such as walls of all kinds, operable partitions, floor-ceiling assemblies, doors, windows, roofs, panels, and other space-dividing elements.

ASTM E90 is designed as a laboratory test that product manufacturers and testing agencies would use. For field evaluation, such as might be performed by a service provider, ASTM E336 is the appropriate test specification.

The unit of measure is known as Sound Transmission Class (STC). STC is an integer rating of how well the door attenuates airborne sound. The higher the number, the better the sound isolation.

Almost all doors can offer a reasonable STC rating. A good STC rating for a standard door might be in the upper 20s or 30s. When your sound control needs are especially high, you may specify acoustic or sound control doors which are available at higher price points than standard doors. These doors can have STC ratings near 50 or higher.

What's Next?

Hopefully, you have begun to consider some of the performance criteria that might be important for you—in doors or other building products. You will discover that there are, typically, product standards and tests that coincide with your desired criteria. Then, it is a matter of conveying your criteria to service providers and asking them to produce evidence that their proposed products have met some related standard of performance.

In Part 2 of this series, we will examine further criteria related to safety and security. You can read Part 2 of "Testing Matters" in the April issue of PUPN.

ABOUT THE AUTHOR: Ben is a product marketing veteran for commercial and institutional buildings. He has worked with entrance systems, building automation, fenestration products, mechanical systems, and other building products. He earned a bachelor's degree in Scientific & Technical Communication from Bowling Green State University (Ohio).