

What is ASTM E-90 and what you need to know about it

In the world of special purpose doors and windows, sound retardant (acoustical) assemblies are one of the most commonly used in commercial building. An acoustical assembly is an acoustical door or window that maintains its basic operating function and is at the same time designed to be a significant barrier to the passage of sound. It is called an acoustical assembly because an entire system is involved.

A sound retardant assembly encompasses not just the door or window itself but all the components around it. For starters, the design of the wall must be at minimum as sophisticated as the door. “The number one error we see in the field is an over-specified door and an underspecified wall. You can’t hope to retard noise with just a door. If the wall is inadequate, the door is not going to do much for you,” states Bob McCluney of Krieger Steel Products, a custom acoustical door and window manufacturer. “The wall, the frame which surrounds the door, the door itself, the hardware components and finally the sealing system, whereby the passage of noise is minimized, all combine to create an acoustical assembly.”

Each of the components contribute to the whole assembly and with the exception of the wall, no single component of this assembly can be designated as having a specific sound rating. Only for the whole assembly can a sound rating level be given.

Sound ratings are typically based off the Sound Transmission Class (STC) scale system. This single rating system enables a designer to match up architectural products that when combined will create an STC rating for the entire assembly controlling the noise and vibration in room, office or even an entire building.

The preferred method for determining the STC rating of a product is a test called the ASTM E-90. (Officially called the “Standard Method for Laboratory Measurement of Airborne Sound Transmission”). During an ASTM E-90 test, a test specimen is mounted between a room containing an isolated source of noise and a receiving room. Sound transmission loss, the difference between the sound level in the source room and the receiving room, is measured at specific sound frequencies and used to arrive at the STC rating. The higher the STC rating calculated, the quieter it is in the receiving room.

The ASTM E-90 test was developed by the association of engineering professionals called American Standard for Testing Materials (ASTM). ASTM technical committees are made up of professionals from around the globe who develop ASTM standards. There are over 130 ASTM technical committees covering diverse industry areas ranging from metals to the environment.

A task group known as the ASTM Committee E33 on Environmental Acoustics was formed in 1972. The committee, with a typical membership of approximately 125, currently has jurisdiction of over 50 standards, published in the Annual Book of ASTM Standards, Volume 04.06. These standards have and continue to play a preeminent role in

determining the characteristics and performance of materials, products, systems and services relating to the acoustical environment. The committee meets twice a year, usually in April and October, with approximately 40 members attending two days of technical meetings designed to address the constant discovery of complex variables that can have an impact on a test specimen's rating.

It goes without saying that the committee has revised the standard countless times. Each revision of the standard must be reviewed and its changes must be examined in detail by a task group made up of testing facility managers, lab technicians and other vested professionals. Once adopted, each revision is numbered by the year in which it was adopted and can carry various suffix letters to indicate the type of revision made; "T" for technical change; "A" for administrative change, a subscript epsilon (ϵ) for editorial change, and so forth. Any standard that has not been reviewed in eight years is automatically dropped.

According to an IIT Research Institute study conducted at Riverbank Acoustical Laboratories, a manufacturer retesting a particular model under succeeding revisions of the test would find a lowering of STC results (anywhere from 2 to 5 levels) because the standard continues to sharpen the lens of scrutiny under which acoustical assemblies are examined.

"The unit of measure has not changed. A decibel has always been a decibel," reminds us Gary Menge of Western Acoustical Laboratories (a member of the ASTM E-90 task group know as Subcommittee E33.03). It is the testing conditions that are fraught with variables. As the standard grows in experience over the years, it reveals the complex variables that must be addressed in order to equalize the conditions that have a potential to affect results.

One such complex variable debated over the last decade is the issue of absorption. When sound waves come in contact with a boundary obstacle, such as a wall or door, a portion of the sound wave energy is reflected, a portion is transmitted through the obstacle and the rest is absorbed by the obstacle. One of the standard methods of measuring the effective sound absorption coefficient of an acoustical material is by finding its effect on the reverberation time, or decay rate, of the sound pressure level in the sound chamber. The total sound absorption in the receiving room is required to determine the noise reduction of the specimen being tested. The key here is to rule out the absorption of sound waves within the chamber that may be attributed to the door being tested. Because the ASTM standard does not provide a resolution for measuring and standardizing absorption levels from one laboratory to the next; the same product tested in laboratories with different absorption levels, can result in different STC ratings.

Another variable that the standard does not currently address is the difference between a door and a partition. While the standard makes a provision that a door must be cycled (opened and shut) a number of times by the lab technician prior to commencing the test, the operating force or the pressure required to release a tightly sealed door, is not addressed.

Interestingly enough E90-2004, the most current standard, still does not address this issue. It references another test standard (ASTM 1408) that measures the operating force required to operate the door. This means that if an acoustical door took 75 lbs of pressure to latch or unlatch against an acoustical seal, a review of E90 test results, namely STC ratings, would not provide such information. Yet, such information is pertinent when evaluating a manufacturer's product and its suitability for a particular need. After all, a door that requires 75 lbs of pressure to open and close is going to be difficult to operate on a daily basis and is certainly not going to pass for a door under the Americans with Disabilities Act.

And while addressing testing variables keeps them plenty busy, the committee also has the burden of preventing testing abuses. There is a story that has circulated over the years concerning a glass manufacturer who found a loop in the test standard. The test was not going as well as the manufacturer had hoped. The new inner layer between two panes of glass was not performing well under the laboratory conditions. While every one, including the laboratory technician, had stopped for lunch the thermostat in the lab was turned up. The temperature in the laboratory, which was exposed to outside weather, started to warm up. After lunch and some additional inspection of the glazing compound another test was run and voila! The STC rating increased and suddenly the manufacturer could boast of being the industry's technical leader with the highest STC rating for this type of glass. After that incident, the committee set a standard lab temperature level at which the ASTM E-90 is to be performed under.

Fortunately test abuses are rare. What's interesting though is the way that manufacturers deal with the constant changes in the standard. The ASTM E90 committee meets and revises the standard every two years, however this does not mean that door manufacturers must, should or would have tested under the most recent standard, which happens to be E90 2004. The expense to test all products every two years is entirely too prohibitive for a manufacturer to take on.

As a result manufacturers, respond in various ways. Some brush the issue under the carpet when asked and retest only when it becomes absolutely necessary, meaning when their test results are old and ridiculously outdated. Others try to convince their audience that the test revisions are essentially no different from the particular version they tested their product under the last time. Fortunately there are those few that see the competitive value of latest test results and try to stay on top of the situation by scheduling tests on a periodic basis.

Although ASTM E-90 is continuously raising the quality of products that qualify for certification, purchasing from a manufacturer that has a track record of ASTM E-90 testing does not assure a product you can depend on. At this time, ASTM E-90 re-testing is not required and there are no expiration deadlines, so certification is only a base to start from. A manufacturer that has the initiative to voluntarily keep its test no more than 5 years old is a good start, however, there are many other factors that must be considered to make an educated choice. From field testing (E-336) to field installation results and

customer satisfaction, choosing the right manufacturer comes down to choosing a company you can count on.