

TECHNICAL

by Steve Hahn

WHERE THERE'S SMOKE

The most common by-product of a fire is smoke. And statistics show that more fire related deaths are actually caused by smoke than by burns. Maintaining a tenable environment – that is, an environment that is not life threatening – during evacuation or while awaiting rescue from areas of a building are primary concerns. When necessary to address those concerns, building codes will require the use of air leakage rated door assemblies – often referred to as “smoke doors”.

Air leakage rated doors are designated by an S-label. Similar to a fire

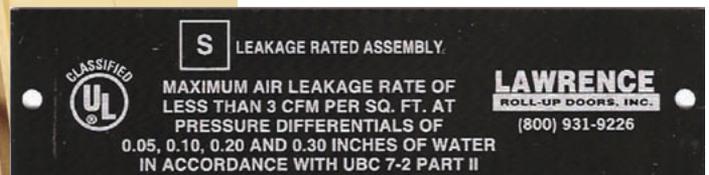
door label, it is a label with an “S” that identifies the door as providing certain levels of protection from smoke by limiting the amount of air that can pass through the door assembly. The degree of protection is expressed as a function of the amount of leakage in cubic feet per minute, per square foot of door area, at varying pressure levels. Different areas of buildings – corridors, elevator lobbies, stairwells, etc. – have different limits for the amount of leakage allowed relative to pressure differentials common to those areas.

Many different types of doors can be S-labeled, including rolling doors. But since smoke doors must close automatically when activated by a smoke detector or alarm system, a rolling fire door – with necessary changes as required by its listing – is usually used and provided with both a fire door label and an S-label.

Like fire doors, smoke doors have their own set of standards. They are tested in accordance with *UL 1784, Air Leakage Tests of Door Assemblies*. These tests determine the amount of air that leaks through a door assembly attached to a sealed chamber at various pressures and temperatures. Installation and maintenance is regulated by *NFPA 105, Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives*.

Prior to the development of test standards (around 1990), doors were sometimes provided with perimeter “gaskets” in an effort to reduce

Rolling fire door being subjected to UL 1784 Air Leakage Tests



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the amount of smoke that could pass through them. This was an improvement, but their effectiveness was not really known.

Today's S-labeled rolling fire doors go much further. A comprehensive series of tests now validates that a specific door design is capable of complying with allowable leakage limits. An approved design may require a particular slat profile, type and size of perimeter seals, specified placement of heat resistant caulking, and other measures that may be necessary to reduce the amount of smoke that can filter its way through and around a rolling door assembly.

Differences in door design, size of door, mounting of door, temperature, and other factors can all potentially affect leakage rates. Doors will tend to leak more through the door perimeter (around the jambs and header) than through the curtain slats. Doors also tend to have higher leakage rates when smoke is at ambient temperature ("room" temperature, approx. 75 deg. F.) than when smoke is "warm" (approx. 400 deg. F.).

Manufacturers normally use listed brush seals to fill the "gaps" between the curtain and guides, and between the curtain and header. Areas such

as the intersection of the jamb and header may be particularly vulnerable to leakage if seals are not correctly installed. S-label doors typically also require special heat resistant caulking between components of the door assembly and between the door assembly and the wall.

Sometimes installing or adjusting that seal on the header may be challenging. And sometimes caulking is slow and messy. But S-label doors are called on to perform in critical life and death situations. For proper performance, all items required to be field installed are necessary – and they must be installed correctly as indicated in the manufacturer's instructions.



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