



## CURRENT DUCT SEALANT TESTING STANDARDS

From time to time our Engineering staff addresses customer questions that have a common theme. Ductmate feels that these issues need to be addressed and would like to share these discussions with our customers, especially those who specify duct related products.

As a duct sealant manufacturer, we are constantly asked if our sealants comply with a particular standard. We would like to share our experience with regard to sealant standards to help simplify your specification writing efforts. Following is a discussion of the applicable standards that should be included in a thorough duct sealant specification.

If you are the person in your company that deals with standards and specifications, then you have probably seen a few new standards for duct sealants. The intent of this essay is to inform you of the differences and purposes of each of these. First we will discuss the particulars of the individual tests, and later what is significant about each one.

### UL 723

This method is the "Test for Surface Burning Characteristics of Building Materials." UL 723, ASTM E-84, NFPA 255, UBC 8-1, and ANSI 2.5 are different names for the same test. As the name implies, this test measures a material's surface burning characteristics, which is its ability to conduct combustion along its surface. This standard is widely used for many building materials, but has no specific requirements for duct sealant performance. It is, however, the testing standard most often specified, mainly in the interest of fire safety. Test results are in the form of "Flame Spread" and "Smoke Developed" indices. Both of these indices compare the tested material's performance of that of red oak. In general, if a material had a flame spread index of 10, it means that its flame spread of 10% of red oak's flame spread. Reported test results are generally rounded off to the nearest number divisible by 5, for example rating of 10 can actually be between 7.5 and 12.5. Usually, specifications call for duct sealants to have ratings of not greater than 25 for flame spread, and not greater than 50 for smoke developed. This is also referenced to as Class 1 by the NFPA. Most sealants on the market easily meet this requirement. This test only tests the sealants after

they are cured, and gives no indication to the flammability of an uncured sealant, such as solvent based products. With the advent of the tests listed below, the UL 723 is now applicable only for sealants to be used on metal ducts.

### UL 181A-M and B-M

The UL 181A-M and B-M standards are only addressed in the building codes in certain locations. Specifically Florida, Texas, and California. In actuality, in order for the duct system to maintain its UL status, only 181A and B listed sealants should be used on fiberglass duct board and flexible ducts respectively. These are actually two separate tests, UL 181A-M and UL 181B-M.

### UL 181 A-M

This standard deals with sealants that are to be used on fiberglass ductboard. Unlike the UL 723 test, this standard consists of a battery of tests, including: fire resistance, pressure cycling, mold resistance, and adhesion tests. All of these tests are done with the sealant applied to the ductboard facing, which is foil reinforced kraft paper. One section of this test is the UL 723 surface burning test, but the sealant is tested as applied to ductboard, instead of inorganic cement board. As you'll see later, this is a major difference. Since this standard actually tests the performance of the sealant, some perceive that sealants meeting this standard are of higher quality than ones that only meet UL 723 standards. This is not necessarily true.

### UL 181 B-M

Flex duct connections are the focus of this standard. While not as rigorous as 181 A-M, it still contains a series of tests. These tests include compatibility with components of flex duct, mold resistance, fire resistance, and adhesion tests. Like the 181 A-M, one section of this test is the UL 723 surface burning test. Unlike the UL 181 A-M, this test is run on inorganic cement board.

### Test Trouble

As I mentioned above, most sealants will easily pass the UL 723 test. The UL 181 A-M is much more difficult to pass. The main reason for this is

## DUCT SYSTEM INSIGHTS WITH AN ENGINEERING PERSPECTIVE

the surface burning test on ductboard. The requirements are still the same, the flame spread must be less than 25 and the smoke developed must be less than 50. The difference is that in the UL 723 test, the substrate is inorganic cement board, which must have flame and smoke numbers of zero, but in the UL 181 A-M test, the substrate is ductboard, which only needs to have flame and smoke numbers less than 25 and 50 respectively. It is not uncommon for the ductboard to have a flame spread that is in the low 20's. Since the substrate is close to the upper limit, the sealant needs to be extremely flame retardant to not be over 25 when tested. (In order to make the sealant that flame retardant, compromises must be made to its quality). Consider replacing with this: In order for the sealant being tested to pass this test, its flame resistance and smoke developed must be very, very low. By adding flame retardants, you can reduce the flame spread, but this generally increases the amount of smoke the sealant will develop. On the other hand, the addition of non-flammable fillers can reduce the flame spread without making more smoke. The downside to this is that the fillers reduce the flexibility of the sealant that is important when a duct deflects under pressure. As with any engineered solution, there is always a compromise. Unfortunately, this does not necessarily lead to a higher quality sealant. PROseal for example will not pass the surface burning test on ductboard, even though it has a flame and smoke numbers of zero on inorganic cement board. In every other test category, PROseal will outperform sealants that are listed for UL 181 A-M. For this reason, UL 181 A-M sealants should not be specified for use on metal ducts. This is not because they won't work, but because other sealants will work better.

### Overlapping Test Methods

Without going into great depth, some sections of these standards are the same, which means many sealants will have multiple listings. Since both the UL 181 A-M and 181 B-M both contain the UL 723 test, it is accepted that any sealant that has passed either of those tests is a Class 1 duct sealant. Also, many of the tests in UL 181 B-M are the same as those in UL 181 A-M. If a manufacturer is getting a sealant tested for UL 181 A-M, they will usually get the UL 181 B-M testing done at the same time to combine the costs. The converse is true. UL 181 B-M is much less complicated than UL 181 A-M, and most quality sealants will pass.

### Wow, that's all really interesting, but what should I specify?

Whenever possible avoid specifying UL 181 A-M for anything but ductboard. UL 723 rated sealants will be

sufficient for metal duct applications. If the sealant has UL 181 B-M (but not A-M) that would also be sufficient. If flex duct is being used, then UL 181 B-M must be specified. A common misconception is that sealants that have UL 181 A/B ratings are better because they have passed more performance tests. This is not necessarily true, since these standards do not test the sealant as it would be used on metal duct.

For your reference, the Ductmate manufactured sealants and the standards to which they comply are listed below.

| Ductmate Sealant  | For Use On                      | Standard Characteristics        |
|-------------------|---------------------------------|---------------------------------|
| <b>PROseal</b>    | Metal<br>Flexible               | UL 723<br>ASTM E-84<br>UL 181 B |
| <b>FIBERseal</b>  | Metal<br>Flexible               | UL 723<br>ASTM E-84<br>UL 181 B |
| <b>Enviroseal</b> | Fiberboard<br>Flexible<br>Metal | UL 181 A<br>UL 181 B            |

