

To: Users of System Sensor duct smoke detectors
From: Systems Application Engineers
Subject: Manufacturer's methods for duct smoke detector testing

National codes and local safety standards recognize the ability of air duct systems to transfer smoke, toxic gases and flames from area to area. Enormous quantities of smoke can be a serious hazard to life safety unless blowers are shut down and /or dampers are closed. The primary purpose of duct mounted smoke detection, therefore, is to prevent injury, panic, and property damage by reducing the spread of smoke. Please note that the NFPA 72 (National Fire Protection Association) has established that duct detectors shall not be used as a substitute for open area smoke detectors. (Chap. 5.14.2 (a), 2002 ed.)

Testing of duct smoke detectors with smoke provides a unique challenge. The quantity of smoke required to produce the proper density is dependent upon multiple environmental conditions such as size of the duct, air velocity, humidity, air stratification, air dilution, and response. In addition, the smoke that must be generated is many times greater than actually required to cause an open area, spot type detector to alarm. It may require that the building be subjected to an actual fire test.

Before any testing is performed, verify that the duct smoke detector is installed per NFPA 72 guidelines and in accordance with the manufacturer's installation instructions.

The procedure for testing System Sensor duct mounted smoke detectors is as follows:

1. The built-in test feature, i.e., the test magnet, test switch, etc., should be performed. These features are designed to meet the intent of the NFPA and Underwriters Laboratories functional test requirements, to electronically or mechanically simulate gray smoke, not to exceed 6%/ft. obscuration. This will assure the detector is operable and will respond to minimum smoke requirements.
2. When attempting to verify that the detector will respond to smoke in the duct airflow, the pressure differential should be measured across the sampling tubes (exhaust & intake) using a manometer. This is the manufacturer's acceptable test.
3. Next, apply smoke directly to the detector head to initiate an alarm. The sampling and exhaust tubes may need to be blocked off for this test and then reopened afterwards.

A "smoke bomb" is not a recommended test method for ionization duct smoke detectors. Based on experience with in-house and field-testing of ionization duct mounted smoke detectors, smoke bombs are not recommended for smoke testing purposes for the following reasons:

- Ionization smoke detectors are most sensitive to smoke particles ranging in size from .01 to .3 microns. Particles out of this range may lead to a slower than usual response. In addition, the particles tend to become larger the farther they travel from the source.
- There are various problems created when using smoke bombs. The smoke generated is a chemical reaction and does not represent a true smoke composition or fire signature for smoke detector activation. They produce cold smoke particles, which are larger and are not easily detected by ionization smoke detectors. These particles are also dependent on relative humidity, distance traveled from the source, and time of activation. This phenomenon is caused by the smoke being a mist rather than suspended solids in warm gases.
- It is also possible to pass a smoke bomb test and be out of the required manometer range for sampling, giving the installer a false sense of proper operation. The manometer test must be performed.

Using a smoke bomb to test ionization smoke detectors is not advised because this procedure does not provide a consistent, measurable method of determining if the detectors are performing properly. If a smoke bomb test must be done, the use of a photoelectric smoke detector is highly recommended. Photoelectric smoke detectors typically respond to smoke particles of .3 to 10 microns in size, which are within the characteristics of particles generated by a smoke bomb.

All smoke is irritating to breathing passages. Persons with respiratory ailments should not be exposed to smoke bombs. It is also recommended that self-contained breathing apparatus be used for exposure to dense concentrations of smoke or prolonged concentrations of lighter smoke density. Always refer to and follow the manufacturer's instructions.

If you have any questions concerning System Sensor products or their application, please contact Technical Services at 1-800-SENSOR2 (736-7672), extension 2.