

IN-DUCT SMOKE DETECTOR (SUMMARY)

CODE, TESTING, AND POLICY

FLORIDA BUILDING CODE MECHANICAL

- IN-DUCT SMOKE DETECTOR – LOCATION - WHERE NEEDED:
 - SUPPLY DUCT (Mech 606.2.1)
 - When the air supply system has a capacity greater than 2,000 CFM
 1. Exception: Not applicable due to NFPA-90 not allowing an exception.
 - RETURN DUCT - (Mech 606.2.3) ONLY in Duct Risers with a CFM capacity that exceeds 15,000 CFM and serving two or more stories
- DUCT SMOKE DETECTOR INSTALLATION AND ACCESS:
 - 304.1 – Manufacturer Installation Instruction on site for inspection
 - Testing to be performed in accordance with manufacturer’s recommended procedures.
 - 304.2 – Conflicts between code & Manufacturer - the most restrictive applies
 - 306.1 – Access for Inspection, Service, Repair and Replacement
 - *“Appliances, controls devices, heat exchangers and HVAC system components that utilize energy shall be accessible for inspection, service, repair and replacement without disabling the function of a fire-resistance-rated assembly or removing permanent construction, other appliances, venting systems or any other piping or ducts not connected to the appliance being inspected, serviced, repaired or replaced.”*
 - This means Ready Access.
- TESTING IN-DUCT SMOKE DETECTORS
 - Alarm monitoring company and building occupants must be advised prior to testing a Smoke Detector that is connected to a monitored alarm system
 - Smoke Detector manufacturer literature must be on site for inspection.
- TESTING WITHOUT SMOKE – satisfies the code requirement for testing smoke detectors
 - Use of a Manometer or similar pressure test apparatus is recommended by all manufacturers
 1. Verify that the pressures fall between the manufacturer’s published ranges (varies by manufacturer – see installation instructions)
 2. After verifying the pressure differentials, use a Magnet in accordance with the manufacturer’s instructions to complete the test.
 - TESTING WITH SMOKE – satisfies the code requirements for testing smoke detectors
 - Policies regarding smoke tests:
 1. Building must be evacuated if performing a smoke test.
 2. Inspector shall not handle, install, or light any smoke emitting devices
 3. Clean Smoke emitting devices are recommended.
 4. Contractor to provide an ANSI approved mask rated for particles down to 3 microns or better for inspector’s use.
 5. Contractor to provide all accessories needed for a smoke test such as smoke emitting devices, ladders, and access to the equipment.
 6. Smoke cartridge capacity (Ft3) and ignition time shall be verified by inspector. This requirement to be determined by contractor.
 7. Policy: Smoke Machines are acceptable as they produce odorless smoke
 8. A smoke test shall be considered a FAIL if the alarm response time exceeds 30-seconds from the moment smoke is introduced into the air distribution system.

DUCT SMOKE DETECTOR TESTING (EXPANDED)

CODE, TESTING, AND POLICY

At time of inspection need to have duct smoke detector manufacture's installation instructions and documentation on site. Follow manufacture's testing criteria **but** magnet and key station testing cannot be the only method, smoke bomb or aerosol smoke testing or other approved testing devices also required (see below).

Most common Duct Smoke Detectors are designed to operate for air speed range of 100 to 4000 FPM

Manometer

To verify sufficient sampling of ducted air, turn the air handler on and use a manometer to measure the differential pressure between the two sampling tubes. The differential pressure should measure between 0.01 and 1.11 inches of water. Most commercially available manometers cannot accurately measure pressure differentials with less than 500 FPM of air speed.

Anemometer

Measure the air speed/velocity using an anemometer.

Low-Flow Systems

Testing Option #1

Smoke Entry Using Aerosol Smoke

This test is intended for low-flow systems (100-500 FPM).

Drill a ¼ inch hole 3 feet upstream from the duct smoke detector. With the air handler on, measure the air velocity with an anemometer. Air speed must be at least 100 FPM. Spray aerosol smoke into the duct through the ¼ inch hole for five seconds. Wait two minutes for the duct smoke detector to alarm. If the duct smoke detector alarms, air is flowing through the detector. Remove the duct smoke detector cover and blow out the residual aerosol smoke from the chamber and reset the duct smoke detector. Use duct tape or other approved method to seal the aerosol smoke entry hole.

Magnet

Hold test magnet where indicated on the side of the duct smoke detector for more than 5 seconds.

Remote station magnet

Hold test magnet to the target area on the remote station for more than 5 seconds.

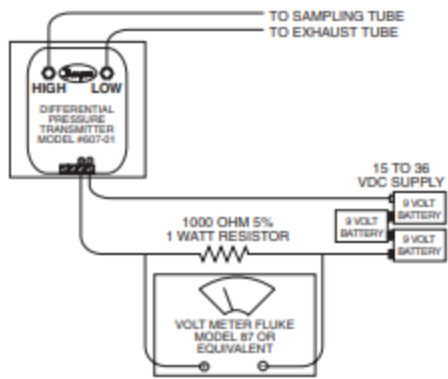
Key

Turn key switch to test position for more than 5 seconds.

Testing Option #2

Differential Pressure Transmitter (Dwyer Series 607 or similar device)

Second option for air speed velocity less than 500 FPM.



1. Verify the air speed of the duct using an anemometer. Air speed must be at least 100 FPM.
2. Using Dwyer Series 607 connect the leads of the meter to either side of the 1000Ω resistor.
3. Allow unit to warm up for 15 seconds.
4. With both HIGH and LOW pressure ports open to ambient air, measure and record the voltage drop across the 1000Ω resistor (measurement 1), 4.00 volts is typical.
5. Using flexible tubing and rubber stoppers, connect the HIGH side of the transmitter to the sampling tube of the duct smoke detector housing, and the LOW side of the transmitter to the exhaust tube of the duct smoke detector housing.
6. Measure and record the voltage drop across the 1000Ω resistor (measurement 2).
7. Subtract the voltage recorded in measurement 1 from the voltage recorded in measurement 2.
8. If the difference is greater than 0.15 volts, there is enough air flow through the duct smoke detector for proper operation.

Magnet

Hold test magnet where indicated on the side of the duct smoke detector for more than 5 seconds.

Remote station magnet

Hold test magnet to the target area on the remote station for more than 5 seconds.

Key

Turn key switch to test position for more than 5 seconds.

Testing Option #3

Smoke bomb

Another option for testing duct smoke detector is by smoke bomb method with smoke entering the return air duct and flowing through to the supply side and testing the supply side duct smoke detector.

Magnet

Hold test magnet where indicated on the side of the duct smoke detector for more than 5 seconds.

Remote station magnet

Hold test magnet to the target area on the remote station for more than 5 seconds.

Key: Turn key switch to test position for more than 5 seconds.

Higher-Flow Systems

Greater than 500 FPM (most systems)

Testing Option #1

For air speed/velocity greater than 500 FPM must use manometer as indicated above to test the air differential of supply sampling tube and return tube of the detector.

Magnet

Hold test magnet where indicated on the side of the duct smoke detector for more than 5 seconds.

Remote station magnet

Hold test magnet to the target area on the remote station for more than 5 seconds.

Testing Option #2

Smoke bomb

Another option for testing duct smoke detector is by smoke bomb method with smoke entering the return air duct and flowing through to the supply side and testing the supply side duct smoke detector.

Magnet

Hold test magnet where indicated on the side of the duct smoke detector for more than 5 seconds.

Remote station magnet

Hold test magnet to the target area on the remote station for more than 5 seconds.

Notes:

Test Certification

Manometer and Differential Pressure Transmitter Certification is required when that option is used, from the contractor responsible for the installation and testing of the duct smoke detector/s.

Onsite Inspection

Building Division inspector to observe smoke test, magnet and key testing. Inspection request must be made and coordinated with parties involved and inspector.

Common Installation notes and requirements:

1. Locate the detector so its sampling tube is positioned in a straight length of square duct between six and ten duct widths from any bends or obstructions.
2. For detection of smoke in the supply air stream, install the duct smoke detector in the supply air duct at a point downstream from the supply fan and air filters
3. For detection of smoke in the return air stream, install the duct smoke detector in the return air duct at a point before the return air stream is diluted by outside air
4. Correct length sampling tube. Sampling tube must extend at least two-thirds across the width of the HVAC duct with the air inlet holes pointed into the direction of airflow
5. Support sampling tubes longer than 36 inches at both ends
6. FBCM 606.3 Access shall be provided to smoke detectors for inspection and maintenance.

SECTION 606 SMOKE DETECTION SYSTEMS CONTROL

606.1 Controls required.

Air distribution systems shall be equipped with smoke detectors *listed* and *labeled* for installation in air distribution systems, as required by this section. Duct smoke detectors shall comply with UL 268A. Other smoke detectors shall comply with UL 268.

606.2 Where required.

Smoke detectors shall be installed where indicated in Sections 606.2.1 through 606.2.3.

606.2.1

To prevent the recirculation of dangerous quantities of smoke, a detector approved for air duct use shall be installed on the **supply side** of air-handling systems as required by NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*. Smoke detectors listed for use in air distribution systems shall be located downstream of the air filters and ahead of any branch connections in air supply systems having the capacity greater than 2000 cuft/min.

Exception: Smoke detectors are not required in the supply air system where all portions of the building served by the air distribution system are protected by area smoke detectors connected to a fire alarm system in accordance with the Florida Fire Prevention Code. The area smoke detection system shall comply with Section 606.4.

606.2.2 Common supply systems.

Where multiple air-handling systems share common supply with a combined design capacity greater than 2,000 cfm (0.9 m³/s), each supply air system shall be provided with smoke detectors in accordance with Section 606.2.1.

Exception: Individual smoke detectors shall not be required for each fan-powered terminal unit, provided that such units do not have an individual design capacity greater than 2,000 cfm (0.9 m³/s) and will be shut down by activation of one of the following:

1. Smoke detectors required by Sections 606.2.1 and 606.2.3.
2. An *approved* area smoke detector system located in the return air *plenum* serving such units.
3. An area smoke detector system as prescribed in the exception to Section 606.2.1.

In all cases, the smoke detectors shall comply with Sections 606.4 and 606.4.1.

606.2.3 Return air risers.

Where return air risers serve two or more stories and serve any portion of a return air system having a design capacity greater than 15,000 cfm (7.1 m³/s), smoke detectors shall be installed at each story. Such smoke detectors shall be located upstream of the connection between the return air riser and any air ducts or plenums.

[F]606.3 Installation.

Smoke detectors required by this section shall be installed in accordance with NFPA 72. The required smoke detectors shall be installed to monitor the entire airflow conveyed by the system. Smoke detectors shall not be required for fan units whose sole function is to remove air from the inside of the building to the outside of the building. Access shall be provided to smoke detectors for inspection and maintenance.

[F]606.4 Controls operation.

Upon activation, the smoke detectors shall shut down all operational capabilities of the air distribution system in accordance with the listing and labeling of appliances used in the system. Air distribution systems that are part of a smoke control system shall switch to the smoke control mode upon activation of a detector.

[F]606.4.1 Supervision.

The duct smoke detectors shall be connected to a fire alarm system where a fire alarm system is required by the Florida Fire Prevention Code. The actuation of a duct smoke detector shall activate a visible and audible supervisory signal at a constantly attended location. In facilities that are required to be monitored by a supervising station, duct smoke detectors shall report only as a supervisory signal, not as a fire alarm.

Exceptions:

1. The supervisory signal at a constantly attended location is not required where the duct smoke detector activates the building's alarm-indicating appliances.
2. In occupancies not required to be equipped with a fire alarm system, actuation of a smoke detector shall activate a visible and audible signal in an *approved* location. Duct smoke detector trouble conditions shall activate a visible or audible signal in an *approved* location and shall be identified as air duct detector trouble.