



Metropolitan Air Technology's Recommendations For Periodic Inspection, Testing & Maintenance Of Fire, Smoke, and Combination Fire/Smoke Dampers

Related Products

- All MAT Dampers: F/S, S, FDD and FD

Initially

Appropriately commission or acceptance test all building systems. Verify and document that all systems operate satisfactorily and perform their appropriate functions per the building's design and that all fire and smoke dampers are properly installed and perform as intended.

Every Six to Twelve Months

- Cycle test (open and closed) all motorized fire and smoke dampers
- Test all dedicated smoke control systems

Every Twelve Months

- Test all non-dedicated smoke control systems
- Test operation of all motorized air control dampers

In First Year and Then Every Four Years

- Visually inspect all fire dampers, ceiling radiation dampers, smoke dampers and combination fire/smoke dampers
- Manually operate (open and close) all fusible link operated fire dampers and ceiling radiation dampers

No routing preventive maintenance is required unless one of the above periodic inspections or test identifies the need for maintenance.



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Purpose

Fire dampers, smoke dampers, combination fire/smoke dampers, ceiling radiation dampers and any other type of damper that performs a safety function in a building's fire protection or life safety system must work properly at the appropriate time during a fire or smoke emergency. This could be years after their installation and initial testing. Everyone agrees that periodic inspection, performance testing, and maintenance are required to assure that these dampers function as intended when required in an emergency. A number of codes, standards, regulatory and manufacturer's publications have been issued recommending testing and maintenance intervals as well as testing and maintenance procedures.

The purpose of this document is to bring the more significant of these recommendations together and to provide guidance for a building owner to develop an appropriate periodic and continuing inspection, testing and maintenance process for all fire and life safety related dampers installed in a building. This document puts more emphasis on life safety equipment, but the air control equipment also needs to be inspected at regular intervals. It is suggested that motor operated dampers be inspected during every other inspection of motorized fire and smoke dampers.

Background

Fire and smoke dampers are designed to perform a number of fire and life safety functions in a building's HVAC and/or smoke control system. Generally, fire and ceiling radiation dampers are designed to close and prevent the spread of fire through an opening in a fire resistive barrier. Smoke and combination fire/smoke dampers generally operate to prevent the spread of smoke by closing to stop airflow, opening to exhaust smoke, or by opening or closing to create pressure differences, which contain or control the spread of smoke.

Underwriters Laboratories (UL) has developed and maintains standards for the testing, qualification, and appropriate labeling of fire dampers (UL 555), smoke and combination fire/smoke dampers (UL555S) and ceiling radiation dampers (UL555C). Manufacturers of these dampers, who have complied with these UL requirements, offer appropriately tested, qualified, and labeled dampers for installation where required in HVAC and engineered smoke control systems.

Building codes and several NFPA and ASHRAE standards

identify where fire and smoke dampers are required to be installed in a building's HVAC and/or smoke control system. Architects and design engineers usually incorporate code required dampers in their building designs but also may incorporate additional requirements depending on a building's specific purpose and intended function. Most building codes allow architects and engineers to demonstrate that a designed system will provide all needed fire and life safety functions even though it may not include all code mandated features (such as dampers).

Commissioning or Acceptance Testing

The term Commissioning is used to define a process in which all aspects of a new building are started, run, checked out and shown to be operating as intended by the building's design. Ensuring that a building's mechanical systems, its HVAC system, and any smoke control or other life safety related systems operate properly (including all fire and life safety related dampers), and documenting their proper operation is the aim of the Commissioning process. This process is also called Acceptance Testing. ASHRAE and NFPA have developed guidelines and procedures for Acceptance Testing or Commissioning of HVAC, smoke control and other fire life safety related systems.

Commissioning a building establishes a point for the beginning of a periodic testing and maintenance program for fire and life safety related dampers. If a building has not been appropriately commissioned, all systems including all dampers must be demonstrated to be operating properly before beginning a continuing testing and maintenance program. It is also extremely important that proper operation of all systems and components be documented to establish a point from which to begin any damper testing and maintenance program. ASHRAE and NFPA recommendations for appropriate documentation should be followed.

Continuous Inspection, Testing and Maintenance

Fire life safety related dampers that are properly applied, equipped with the appropriate UL labels, appropriately installed and demonstrated to function as intended through a building commissioning process should require no specific preventive maintenance. The procedures hereinafter discussed are intended to ensure that nothing interferes with a damper's proper operation and to identify and eliminate a number of potential situations, which could so interfere.



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Generally there are two distinctly separate types of fire and smoke dampers/

- **Fusible Link Operated Dampers**
Fire dampers and ceiling radiation dampers usually are held in an open position by a fusible link, which is designed to melt at a certain temperature allowing gravity or a spring to close the damper. These dampers then remain closed until reopened manually requiring a new fusible link to be installed. Some of these dampers incorporate a latch to hold them in the closed position, others do not.
- **Motor Operated Dampers**
Smoke dampers and combination fire/smoke dampers are most often, motor operated. An electric or pneumatic actuator is incorporated as part of the damper assembly. This actuator, responding to control signals from devices such as a high temperature thermostat, a smoke detector, a building's Fire Control Command Center, a sprinkler water flow switch, or possibly other such devices, will position the damper open or closed allowing it to execute its appropriate function during periods of normal or emergency operation.

Cycle Test Each Motor Operated Damper at Least Once Every Six to Twelve Months

All smoke and combination fire/smoke dampers equipped with electric or pneumatic actuators should be cycled open and closed on a regular periodic basis. This may occur in normal system operation if systems are regularly shut down (I.E. daily or weekly) and if the motorized fire and smoke dampers are arranged to shut or cycle when their corresponding system is shut down.

In any event, a procedure should be established to cycle all motorized fire and smoke dampers a minimum of one time every six months to one year. This will verify that each damper is operational and prevent the remote possibility that a damper actuator, continuously actuated for long periods of time, loses its ability to close when appropriately signaled to do so.

This six to twelve months check of all motorized fire and smoke dampers should be accomplished, wherever possible, by simulating an actual fire emergency. Operation of dampers with remote positioning indication can be verified by observing the remote position indication. In the absence of any

remote damper position indication, the damper actuator (and damper where appropriate) shall be observed, as it is cycled open or closed. As all damper and actuator manufacturers require this periodic testing, appropriate records should be maintained documenting that each damper has been cycle tested a minimum of once every six months.

Testing of Smoke Control Systems

NFPA 92A (Standard for smoke control systems utilizing barriers and pressure differences) mandates the following:

- The smoke control system shall be operated for each control sequence in the current design criteria.
- Operation of the correct outputs for each given input shall be verified.
- Where standby power is provided, tests shall also be conducted under standby power.
- Dedicated systems should be tested semi annually.
- Non-dedicated systems should be tested at least annually.

Dedicated Systems are smoke control systems that have no function other than providing smoke control, such as a stairwell pressurization system. The previously discussed requirement for every six month (semi annual) cycle testing of all motor operated fire/smoke dampers should be a part of the semi annual testing of any dedicated smoke control system.

Non Dedicated Systems are smoke control systems that utilize part of all of a building's HVAC system to perform smoke control functions during a fire emergency, such as a zoned smoke control system. Motorized fire and smoke dampers that are part of any non dedicated smoke control system must be cycle tested every six months. If these systems are only tested on an annual basis, provisions must also be made to cycle test all associated motorized fire smoke dampers on a six month or semi annual basis.

Inspect all Fusible Link Operated Dampers at One Year After Installation and at Least Every Three Years After

Unlike motor operated dampers, fusible link operated dampers cannot be cycled open and closed without accessing the damper and manually removing and reinstalling the fusible link. As this is an extremely time consuming process, and because this introduces the possibility the fusible link may be reinstalled improperly, actual cycling (open and closed) of fusible link operated dampers is recommended at first year anniversary and every three years after.



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NFPA 90A-2002 (Standard for the installation of air conditioning and ventilating systems)

Recommends: Each damper should be examined every 2 years ensuring that it is not rusted or blocked, giving attention to hinges and other moving parts. It is recommended that dampers operate with normal system airflow to ensure that such tests are performed safely and do not cause system damage.

Requires: The following maintenance be performed on fusible link operated dampers at least every 4 years.

- Fusible links (where applicable) shall be removed.
- All dampers shall be operated to verify that they close fully.
- The latch, if provided, shall be checked.
- Moving parts shall be lubricated as necessary.

MAT recommends any obstructions, dirt build up, and any rust or corrosion be removed using mild solvents or detergents. If needed, damper tracks and blade hinges may be lubricated with a dry lubricant such as silicone spray or TFE Dry Lube. Never use a petroleum based lubricant as it will attract dust and eventually impede a damper's operation.

During any inspection and testing of fusible link operated dampers, MAT recommends the following:

- Caution is advised when a fusible link is tripped or suddenly released. Gravity or spring operated dampers may slam closed causing an abrupt interruption of airflow. As this could cause damage to ductwork, consideration should be given to conducting these tests without system airflow.
- When removing the fusible link to check damper operation, be sure to keep fingers, hands, and any other body parts out of the blade travel path to prevent injury.
- Check closure springs. If defective, contact damper manufacturer for replacement procedures.

Note: Some fire dampers (especially spring operated fire dampers) may, because of their size and/or location, be difficult or in some cases impossible to manually open and close. In these instances, a thorough inspection should be made to ensure that nothing would prohibit the damper from closing. This should include verifying that the damper has been installed squarely and free from racking or twisting and that blade channels are free of all obstructions.

Additional Testing, Maintenance and Inspection Recommendations from MAT

The preceding procedures are strongly endorsed by AMCA (the Fire and Smoke Damper Manufacturers Trade Association) along with the following recommendations:

Conduct a recommissioning or acceptance testing program after any renovation or remodeling project

Any remodeling, reconstruction or other changes to a building, even those that do not appear to affect a building's HVAC or smoke control system, can introduce dirt or debris into the system. Dirt or debris is likely to interfere with proper damper operation. Repeating the original acceptance test or commissioning procedure is recommended to ensure proper operation of all systems and components, including fire and smoke dampers. In any event, appropriate stops must be taken to make certain any remodeling or reconstruction has not adversely affected any fire protection or life safety system.

All fire smoke and life safety related dampers should be inspected every two years

Previously stated recommendations call for cycle testing of all motor operated dampers every six to twelve months, the operational testing of smoke control systems every six to twelve months and the physical inspection of all fusible link operated dampers every three years. No periodic preventive maintenance is required unless a periodic inspection or test reveals a specific need.

As cycle testing of motor operated dampers does not always require a visual inspection of the damper (operation can often be verified by remote indication), the additional requirement of visually inspecting motor operated dampers every two years is recommended. As part of the inspection procedure MAT recommends the following:

- Remove any obstructions, dirt, rust, corrosion, or other observed conditions that could impede proper damper operation. Clean damper blades and other moving parts if necessary. Use of mild detergent or solvents is recommended for any required cleaning.
- Check linkage between actuator and damper and tighten or adjust if necessary.
- Cause the actuator to operate the damper open and closed. Operation should be smooth and positive throughout entire stroke. Verify that damper blades close and open completely.
- If necessary lubricate linkage, bearings and other moveable



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parts using a dry lubricant such as silicone spray or TFE Dry Lube to ensure smooth operation. Never use a petroleum based lubricant as it will attract dust and eventually impede a damper's operation.

What if a fire smoke damper actuator fails to operate properly?

Actuators supplied as an integral part of any UL labeled fire/smoke damper are intended to operate properly throughout the expected design life of the system; however premature failures will occasionally occur. If, during any period test of inspection, a fire/smoke damper actuator fails to operate properly, the following steps should be taken to ensure that the actuator itself is inoperable:

- Verify that appropriate power (voltage or pneumatic air pressure) is being supplied to the actuator.
- Determine what condition and specific control signal (from a thermostat, smoke detector, etc.) are required to cause a damper's operation. Verify that the appropriate control signal is being generated. If this is impractical, disconnect any system wiring or piping and provide the appropriate voltages and signals from a separate reliable source. If the actuator fails to operate, it should be replaced.

Any field replacement of a fire/smoke damper actuator should follow the damper manufacture's specific instructions for this procedure. Fire/smoke dampers and their installed actuators are tested and qualified as a unit by UL. The actuators themselves must also meet specific requirements developed by UL and each damper manufacturer. MAT recommends that any actuators requiring field replacement be obtained from the damper manufacturer who originally supplied the dampers, along with a detailed procedure for appropriate field replacement. Use of a similar actuator obtained through local distribution channels may not provide all appropriate and required features.

Appropriately record all periodic inspections, tests and any maintenance performed on any dampers

An appropriate record or log page should be established for each fire or life safety related damper installed in a building. It is suggested that this record page include the damper's type, manufacturer, make or model number, ratings, date installed, date of commissioning and or acceptance, location (including system or portion of system it is serving), and a listing of recommended periodic inspections and testing. Space should also be provided to record observations made during periodic

inspection and testing as well as any corrective actions taken. Any replacement of actuator or other parts of damper components should be recorded for future reference.

The actual format of any log or record sheet can vary to suit a particular building's needs. Development of an appropriate digital format is encouraged, as this would facilitate sorting by systems or other means to aid in organizing and conducting the periodic inspection process.

Reference List of Publications Related to Periodic Inspection, Testing and Maintenance of Fire and Smoke Dampers

Published by the National Fire Protection Association

- NFPA 90 A Installation of air conditioning and ventilating systems
- NFPA 92 A Standard for smoke control systems using barriers and pressure differences
- NFPA 92 B Guide for smoke management systems in malls, atria and large areas

Published by the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE)

- ASHRAE Guideline 5-1994 Commissioning of smoke management systems
- ASHRAE Guideline 1-1996 The HVAC Commissioning Process

Published by Underwriter's Laboratories

- UL 555 Standard for fire dampers
- UL 555S Standard for smoke dampers
- UL 555C Standard for ceiling dampers
- Marking and Application Guide - Dampers for fire barrier and smoke applications & ceiling dampers