



# Guide for Commissioning and Periodic Performance Testing of Fire, Smoke and Other Life Safety Related Dampers

## Purpose

Fire Dampers, Smoke Dampers, Combination Fire Smoke Dampers, Ceiling Radiation Dampers, and other types of Dampers that perform as part of a building's Fire Protection or Life-Safety System must function properly during a fire or life-safety emergency. Proper installation and periodic performance testing are required to ensure these dampers function as intended in a fire emergency.

The purpose of this document is to provide recommendations for the proper commissioning of Fire and Life Safety Related Dampers and to describe the appropriate intervals and methods for performing periodic performance testing of these dampers.

## Background

Life Safety Dampers are designed to perform a number of functions in a building's HVAC, Fire and/or Smoke Control System and are an integral part of the overall life-safety system within the building. Generally, Fire Dampers are designed to close and prevent the spread of fire through an opening in a fire resistive barrier. Ceiling Radiation Dampers are designed to close and reduce the transfer of heat through an opening in the ceiling membrane of floor-ceiling or roof-ceiling assembly. Refer to the specified ceiling design for details regarding penetrations. Smoke Dampers operate to prevent the spread of smoke by closing to stop airflow or by opening to exhaust smoke. They can also be opened or closed to create pressure differences (as in an engineered smoke control system) to reduce the spread of smoke. Combination Fire Smoke Dampers perform the dual role of both Fire Dampers and Smoke Dampers.

Underwriters Laboratories (UL) has developed and maintains standards for the testing, qualification, and appropriate labeling of Fire Dampers (UL 555), Smoke Dampers (UL 555S), Combination Fire Smoke Dampers (UL 555 and UL 555S) and Ceiling Radiation Dampers (UL 555C & UL 263). Manufacturers of these dampers, who have complied with these UL requirements, provide classified 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, Smoke and Ceiling Radiation Dampers are required to be installed in a building's HVAC and/or Smoke Control System. Architects and Design Engineers incorporate Code required dampers in their building designs but also may incorporate additional requirements depending on a building's specific purpose and intended function.

## Commissioning or Acceptance Testing

The term Commissioning is used to define an inspection process to determine if all components of a building are operating as intended by the building's design. Ensuring that a building's mechanical system, 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 result of the Commissioning process. This process is also known as Acceptance Testing.

Below are the AMCA recommended checklists for the commissioning of Fire and Life-Safety Related Dampers. For specific installation requirements of the brand and model damper being commissioned, the damper manufacturer's installation instructions shall be referenced.

### Fire Dampers and Combination Fire Smoke Dampers

1. **Positioning of the Damper in the Opening** – Unless specifically allowed by the damper manufacturer's installation instructions, the centerline of the fire damper's frame shall be located in the plane of the fire rated assembly.
2. **Damper Sleeve** – Unless the damper frame is wide enough to provide for direct attachment of retaining angles, all fire dampers shall be mounted in a sleeve fabricated per the damper manufacturer's installation instructions. The sleeve shall not extend more than 6 inches beyond the wall or floor opening unless there is an actuator or factory mounted access door on the damper. When an actuator or factory mounted access door is installed, the sleeve shall not extend more than 16 inches beyond the wall or floor opening. The sleeve is still limited to extending 6 inches beyond the wall or floor opening on the side opposite the actuator or factory mounted access door.
3. **Clearance between Damper and Wall/Floor Opening** – Most dampers are tested with defined clearances between the damper's sleeve and the wall or floor opening. Unless otherwise indicated in the installation instructions, the annular space between the sleeve of the damper and the wall/floor opening should not be filled with firestop materials such as fill, void or cavity materials. Reference the damper manufacturer's installation instructions for the specific clearance requirements.
4. **Securing Damper and Sleeve to the Wall/Floor Openings** – Most approved damper installation methods require the use of retaining angles to secure the damper in the wall or floor opening. Reference the damper manufacturer's installation instructions for the required material gauge of the retaining angles, the required overlap between the retaining angles and the wall or floor, and the spacing and type of fasteners to be used.
5. **Duct to Sleeve Connections** – Dampers are tested and approved to use specific methods for connecting the damper sleeve to adjoining ductwork. Reference the damper manufacturer's installation instructions for the allowable duct to sleeve connections.
6. **Damper Access** – Access to the dampers shall be provided. Access shall be large enough to allow inspection and maintenance of the damper and its operating parts. The access points shall be permanently identified on the exterior by a label having letters not less than ½ inch in height reading: FIRE/SMOKE DAMPER or FIRE DAMPER.
7. **Damper Flow and Pressure Ratings** – For dynamic fire dampers and combination fire smoke dampers, it shall be verified that the system airflow and pressure are within the damper's ratings.

8. **Operation of the Damper** – After the damper is installed it shall be cycled to ensure proper operation. The operation test performed as part of the commissioning process shall follow the same procedure described in the Periodic Performance Testing section below.

### **Smoke Dampers**

1. **Positioning of the Damper Relative to the Opening** – The centerline of the damper shall be mounted within 24 inches of the opening it is protecting. In addition, no ductwork shall branch-off between the damper and the wall or floor opening it is protecting.
2. **Sealing the Damper Frame to the Ductwork** – Many damper installations require that the damper frame be sealed to the ductwork it is being installed in. Reference the damper manufacturer's installation instructions to determine if this requirement applies and to determine the allowable sealants.
3. **Damper Access** – Access to the dampers shall be provided. Access shall be large enough to allow inspection and maintenance of the damper and its operating parts. The access points shall be permanently identified on the exterior by a label having letters not less than ½ inch in height reading: SMOKE DAMPER.
4. **Damper Flow and Pressure Ratings** – It shall be verified that the system airflow and pressure are within the dampers ratings.
5. **Operation of the Damper** – After the damper is installed it shall be cycled to ensure proper operation. The operation test performed as part of the commissioning process shall follow the same procedure described in the periodic performance testing section below.

### **Ceiling Radiation Dampers**

1. **Hourly Rating** – Ceiling dampers carry a maximum hourly rating for the assembly in which they are installed. Check that the maximum hourly rating of the damper installed is approved for the same hourly rating as the ceiling assembly.
2. **Positioning of the Damper in or Over the Penetration** – The damper can be installed on top of a steel diffuser, sitting directly on the rated ceiling grid, in a steel duct drop, or supported such that the frame rest at the penetration. Refer to the manufacturer's installation instructions for the maximum allowed distance that the closed blades are allowed from the bottom of the rated ceiling. In the case of drywall installation, consult instructions for maximum allowed clearance between penetration and damper frame.
3. **Thermal Blanket** – When a damper is not located directly in the penetration and the damper frame is more than 1 inch smaller than the penetration, then a thermal blanket is normally required to reduce heat transfer across the grille back pan. Refer to the manufacturers installation instructions for the recommended material and size of the thermal blanket.
4. **Clearance between Damper, Grille, Duct, and Wall/Floor Opening** – Most dampers are tested with defined clearances as specified in their instructions. If not specified, a rule of thumb is to keep tolerances minimal (less than 1/8 inch) between connecting components. If possible, have the largest component extend over the smaller one below it. Reference the damper manufacturer's installation instructions for the specific clearance requirements.

5. **Securing Damper to the Sleeve, Grille, Ductwork** – Most of the time, dampers are to be installed so that they are supported by the structural members above them or the ceiling grid. Ceiling dampers are not normally supported by the drywall, gypsum, or ceiling tiles alone. They are normally supported via steel wires, hangers, or duct drops with direct fasteners such as screws, rivets, and bolts. Reference the damper manufacturer's installation instructions for the required material and fasteners.
6. **Grille to Damper to Duct Connections** – Unless otherwise stated in the manufacturer's installation instructions, the damper will either lie on the ceiling grid or cover the neck of the diffuser. If connected to duct, the damper should be installed inside the duct connection.
7. **Operation of the Damper** – After the damper is installed, the fuse link shall be removed and the damper blades allowed to close upon its own mechanics. Cycling the damper ensures proper operation. The operation test performed as part of the commissioning process shall follow the same procedure described in periodic performance testing section below.

## Periodic Performance Testing

Fire Life-Safety related dampers that are properly applied and installed and that have proven the ability to function as intended through a building commissioning process should require no specific on-going maintenance beyond the periodic testing described below to confirm operability.

Although the required frequency of this periodic operation testing varies by local jurisdiction, most local requirements reference one of two national standards, either NFPA 80 or NFPA 105. NFPA 80 covers the requirements for fire dampers and NFPA 105 covers the requirements for smoke dampers. Both documents contain the following frequency requirements for periodic operation testing:

*Each damper shall be tested and inspected one year after installation. The test and inspection frequency shall then be every 4 years, except in hospitals, where the frequency shall be every 6 years.*

The method used to perform the periodic operation testing depends on the type of damper. More specifically, it depends on how the damper operates. From an operability standpoint, fire life-safety related dampers fall into one of the two following categories:

1. **Dampers Requiring a Fusible Link to Operate** – Most Fire Dampers and Ceiling Radiation Dampers, and some Combination Fire Smoke Dampers are held in an open position by a fusible link. The fusible link is designed to melt at a specified temperature allowing gravity or a spring to close the damper. After the fusible link has melted these dampers remain closed until reopened manually and a new fusible link is installed.
2. **Dampers That Do Not Require a Fusible Link to Operate** – Smoke Dampers, some Fire Dampers and most Combination Fire Smoke Dampers do not use fusible links to operate. These dampers use an electric or pneumatic actuator to operate the damper. Fire Dampers and Combination Fire Smoke Dampers that do not use fusible links use a bi-metallic disc type thermostat to interrupt electrical power or air pressure to the actuator at a specified temperature. Once the electrical power or air pressure is interrupted the spring return feature of the actuator closes the damper.

### **Periodic Performance Testing for Fusible Link Operated Dampers**

The recommended procedure for performing the periodic operation testing on fusible link operated dampers is described below. As always, the damper manufacturer's installation and operation instructions should be followed:

1. For safety considerations, ensure that the fan is off.
2. With the damper in the full-open position, remove the fusible link. Care should be taken to ensure that there are no obstructions, including hands, in the path of the damper blades before the fusible link is removed.
3. Once the fusible link is removed, ensure that the damper closes completely without assistance. If the damper is designed with a latch to hold the damper in the full-closed position confirm that the damper latches properly.
4. Return the damper to the full-open position and replace the fusible link. If the link appears damaged, replace with a functionally equivalent link.

### **Periodic Performance Testing for Dampers That Do Not Use a Fusible Link to Operate**

The recommended procedure for performing periodic operation testing on dampers that do not require a fusible link to operate is described below. Two procedures are described. The first describes the procedure for dampers designed with position indication switches to verify that the damper has reached the full-open and full-closed position. These switches can be wired to local or remote control panels or building automation systems (BAS) to indicate if the damper is in the full-open position, the full-closed position, or neither. The second procedure describes the procedure for testing dampers without position indication switches. As always, the damper manufacturer's installation and operation instructions should be followed.

#### **Dampers with Position Indication Wired to Indication Lights, Control Panels or BAS**

1. Use the signal from the damper's position indication device to confirm that the damper is in the full-open position.
2. Remove electrical power or air pressure from the actuator to allow the actuator's spring return feature to close the damper.
3. Use the signal from the damper's position indication device to confirm that the damper reaches its full-closed position.
4. Reapply electrical power or air pressure to reopen the damper.
5. Use the signal from the damper's position indication device to confirm that the damper reaches its full-open position.

#### **Dampers without Position Indication**

1. Visually confirm that the damper is in the full-open position.

2. Ensure that all obstructions, including hands, are out of the path of the damper blades and then remove electrical power or air pressure from the actuator to allow the actuator's spring return feature to close the damper.
3. Visually confirm that the damper closes completely
4. Reapply electrical power or air pressure to reopen the damper.
5. Visually confirm that the damper is in the full-open position.

In addition to these requirements, NFPA 72 and NFPA 92 describe the periodic testing requirements for smoke control systems. Dampers that are part of smoke control systems shall be cycled as part of this testing.

## **List of Publications Referenced in this Document**

*UL 555 Standard for Fire Dampers*

*UL 555S Standard for Smoke Dampers*

*UL 555C Standard for Ceiling Dampers*

*UL 263 Standard for Fire Tests of Building and Construction Materials*

*NFPA 80 Standard for Fire Doors and Other Opening Protectives*

*NFPA 105 Standard for the installation of Smoke Door Assemblies and Other Opening Protectives*

*NFPA 72 National Fire Alarm and Signaling Code*

*NFPA 92 Standard for Smoke Control Systems*