

ENGINEERING REPORT

TOPIC: TESTING AND MAINTENANCE OF LIFE SAFETY DAMPERS

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Purpose

Life safety dampers like fire dampers, smoke dampers, combination fire/smoke dampers, ceiling fire (radiation) dampers that perform as an integral part of a building's fire protection strategy must function properly during a fire or life safety emergency. Proper installation, commissioning and periodic performance testing are required to ensure these dampers function as intended in a fire emergency.

Damper Types



Curtain Fire Damper (D)IBD



Multiple Blade Fire Damper (D)FD



Smoke Damper (SD)



Combination Fire Smoke Damper (FSD)

Proper Installation

Locations: All fire, smoke, combination fire/smoke, and ceiling fire (radiation) damper locations shall be shown on the drawings of the air duct systems.

Fire and Combination Fire/Smoke Damper Installation: Install per manufacturer's installation instructions by model.

Common installation items include the following categories:

- Framing
- Opening
- Sleeve length and gauge
- Orientation
- Mounting Angles (one side or both sides)
- Duct/Sleeve Connections

Ceiling Fire (Radiation) Damper: Install in accordance with the manufacturer's installation instructions in fire resistance-rated floor/ceiling or roof/ceiling assemblies.

Access: Dampers equipped with fusible links, internal operators, or both, shall be provided with an access door or provided with a removable duct section to provide access for inspection, maintenance and testing.

Operational Test: Each damper should be tested after installation. This test is performed to verify that the damper is installed properly and that there are no obstructions to interfere with the operation of the dampers.

Proper Commissioning

Commissioning: The term commissioning is used to define an inspection process to determine if all components of a building are operating as intended. Proper commissioning ensures that a building's mechanical, HVAC, and smoke control systems operate properly (including all Fire and Life Safety Related Dampers). Documenting their proper operation is required as part of the commissioning process.

Commissioning should be performed one year after installation and/or prior to the building being occupied. The commissioning process includes:

- Smoke and combination fire/smoke damper operational test after the building's HVAC system has been balanced
- Function and system verification of all indicating devices, such as end switches.
- Verification of smoke detection activation (when provided), the smoke detector shall be activated in accordance with the requirements of NFPA72.

Records: All inspections, operational tests and commissioning to be documented and maintained by the property owner and made available to the authorities having jurisdiction (AHJ) upon their request. The documentation shall indicate the following information:

- Location of the damper
- Date of inspection
- Name of inspector
- Deficiencies or discoveries (if any)
- Indicate when and how the deficiencies were corrected.

Damper Types: These fall into one of the two following categories depending upon the operability:

1. Dampers Requiring a Fusible Link to Operate

Most fire dampers and ceiling fire (radiation) dampers, and some older generation combination fire/smoke dampers are held in an open position by a fusible link. The fusible link melts 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

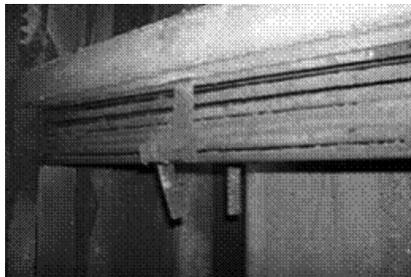
Smoke dampers and most combination fire/smoke dampers do not use fusible links to operate. These dampers use an electric or pneumatic actuator to operate the damper. A bi-metallic disc type thermostat is used to interrupt electrical power or air pressure to the actuator at a specified temperature. Once the electrical power or air pressure is interrupted the spring return feature of the actuator closes the damper.

Proper Periodic Performance Testing

Fire Life Safety related dampers that are properly applied and installed, and that have the proven 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 functionality.

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.



Fusible link dampers should be tested per NFPA standards to avoid non-functional situations as shown above.

Fusible Link Operated Dampers



Attention: Dampers may be spring loaded and could cause harm if caution is not taken.

The recommended procedure for performing the periodic operation testing on fusible link operated dampers.

1. For safety considerations, ensure that the fan is off.
2. Check closure springs. If damaged or defective, repair or replace.
3. With the damper in the fully opened 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.
4. Once the fusible link is removed, ensure that the damper closes completely without assistance. If the damper is designed with a latch to hold in the fully closed position, confirm that the damper latches properly.
5. Return the damper to the fully opened position and replace the fusible link. If the link appears damaged, replace with a functionally equivalent link.
6. Clean the damper blades and other working parts as necessary.



Non-Fusible Link Operated Dampers

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 for dampers without position indication switches and dampers with position indication switches.

The first procedure describes how to test dampers without position indication switches. This requires full access to the damper/actuator and it is similar to fusible link operated dampers.

1. Virtually 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.

The second describes the procedure for dampers designed with position indication switches. The blade positioning switches verify that the damper has reached the fully-opened and fully-closed positions. These switches can be wired to local or remote control panels (MCP), dedicated testing and maintenance systems, like the Ruskin Inspector™, or a typical building automation system (BAS).

1. Use the signal from the damper's position indication device to ensure the damper is in the fully open position.
2. Remove electrical power (or air pressure) from the actuator, allowing the actuator to spring to the fail position.
3. Use the signal from the damper's position indication device as an inspection to ensure the damper reaches the fully closed position.
4. Reapply electrical power (or air pressure) to open the damper.
5. Use the signal from the damper's position indication device as an inspection method to ensure the damper reaches the fully opened position.

Damper Test Switches (DTS)

The Damper Test Switches (DTS) and (DTS-SD) are optional “momentary” push button test switches available on Ruskin smoke and combination fire/smoke dampers. The DTS gives maintenance personnel the ability to “cycle test” the damper by pushing and holding the button until the damper has cycled.



Master Control Panels (MCP)

Optional master control panels ship loose for field installation and come with a momentary push button (MCP4) or keyed switch (MCP2). Both include indicator lights and are for use with smoke and fire/smoke dampers. The lights are red, indicating a closed damper position, and green for open damper indication. Both solutions provide a remote mounted panel for testing, eliminating the need for access to the damper.



Wireless Remote Testing

Ruskin's optional wireless damper Inspector™, utilizing wireless communication protocol by EnOcean®, is the ideal solution for mandatory testing of motorized life safety dampers per NFPA* and Building Code requirements. The Ruskin Wireless Inspector™ includes the RFDI (Radio Frequency Damper Interface) located at each damper with factory switch package and one RFSC (Radio Frequency Smart Communicator). The RFSC includes an LCD screen displaying RFDI serial numbers or tags and damper status after cycle testing. Performing the scan function will locate all dampers in range. A microprocessor in the RFSC stores all test results which can be downloaded using the factory provided USB cable and stored to your personal PC.



- Satisfies NFPA requirements* for both initial and periodic testing of life safety dampers
- RFDI – Radio Frequency Damper Interface displays damper address on LCD screen
- RFSC – Radio Frequency Smart Communicator can control dampers up to 90 feet away and includes microprocessor that stores all test results for future reference
- Wireless communication protocol by EnOcean®



Network Testing

The Classic Inspector™ network continuously monitors and records the health and status of all motorized smoke and combination fire/smoke dampers. The Classic Inspector™ is also a damper testing system that is used to test each damper as scheduled automatically, without going to each damper and manually testing. The Classic Inspector™ includes a fire/smoke damper interface (FSDI), fire/smoke damper control panel (FSDPC), factory commissioning and testing to ensure every damper functions as intended prior to building turnover.

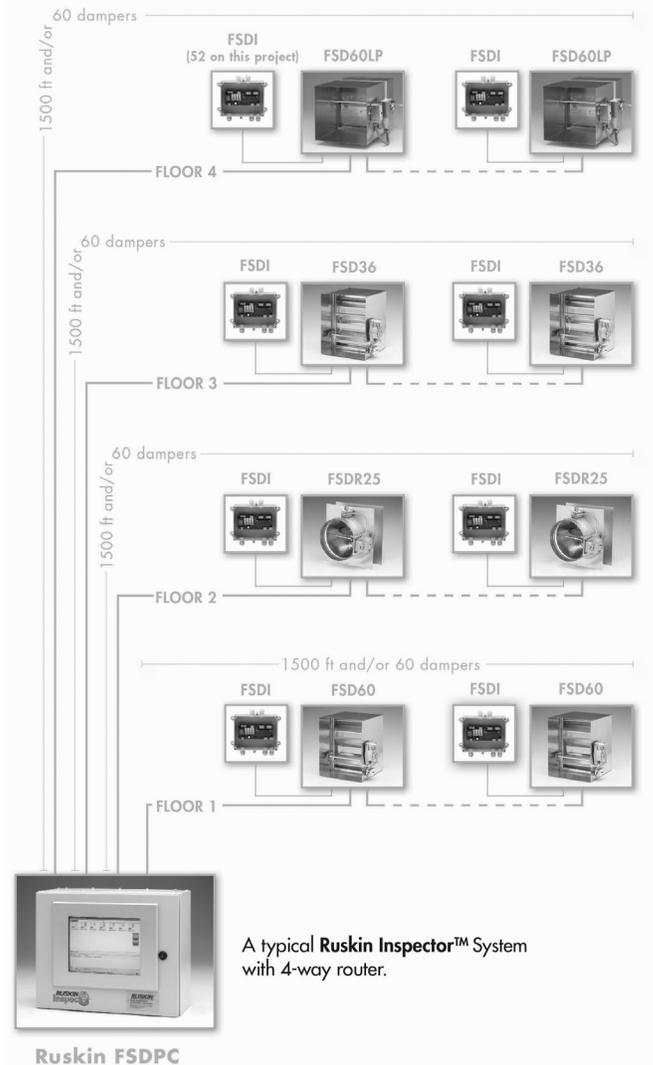
Fire/Smoke Damper Interface (FSDI) - FSDI provides the necessary interface to allow communications between the damper and the Ruskin Inspector™ FSDPC. Any life safety damper equipped with the FSDI is Ruskin Inspector™ ready. Up to 500 devices may be installed on a single panel.



Fire/Smoke Damper Control Panel (FSDPC) - is the heart of the Ruskin Inspector™ system. The FSDPC control panel is equipped with a Windows embedded operating system that is fully programmed and ready for commissioning. The touch screen monitor makes viewing the current health and status of each device simple. Navigate through each group of devices with an intuitive graphical user interface (GUI). Testing of all devices on the network is fully automated. The data log records all activity, providing necessary test report documentation for use of Authorities Having Jurisdiction (AHJ).



CONTINUOUS 24/7/365 DAMPER MONITORING WIRED INSPECTOR™ SYSTEM



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

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