



MANUAL – MAINTENANCE, TESTING AND INSPECTION RECOMMENDATIONS

| Fire, Smoke and Control Dampers

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PRICE[®]

FIRE, SMOKE AND CONTROL DAMPERS

TABLE OF CONTENTS

Maintenance, Testing and Inspection Recommendations

Recommended Maintenance Schedule	1
Purpose	1
Background	2
Commissioning or Acceptance Testing	2
Continuous Inspection, Testing and Maintenance	3
References	5
Recommended Replacement Parts	5

FIRE, SMOKE AND CONTROL DAMPERS

MAINTENANCE, TESTING AND INSPECTION RECOMMENDATIONS

Recommended Maintenance Schedule

RELATED PRODUCTS:

All model FSD, SSD, FDD, FD, CCD, BDD, CFS and CD dampers.

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 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.

EVERY TWO YEARS

- Visually inspect all Fire Dampers, Ceiling Radiation Dampers, Smoke Dampers, and Combination Fire/Smoke Dampers

EVERY FOUR YEARS

- Manually operate (open and close) all fusible link operated Fire Dampers and Ceiling Radiation Dampers

No routine preventive maintenance is required unless one of the above periodic Inspections or tests identifies the need for maintenance.

Purpose

Fire Dampers, Smoke Dampers, Combination Fire/Smoke Dampers, Ceiling Radiation Dampers and any other type of damper that performs a safety function in 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 appropriate periodic and continuing inspection, testing and maintenance processes 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.

FIRE, SMOKE AND CONTROL DAMPERS

MAINTENANCE, TESTING AND INSPECTION RECOMMENDATIONS

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/ULC) has developed and maintains standards for the testing qualification and appropriate labelling of Fire Dampers (UL555/ULC S-112) Smoke and Combination Fire/Smoke Dampers (UL555S/ULC S-112.1) and Ceiling Radiation Dampers (UL555C). Manufacturers of these dampers who have complied with these UL requirements offer appropriately tested, qualified, and labelled 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.

ASHRAE and NFPA have developed guidelines and procedures to Acceptance Testing of 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-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.

FIRE, SMOKE AND CONTROL DAMPERS

MAINTENANCE, TESTING AND INSPECTION RECOMMENDATIONS

Continuous Inspection, Testing, and Maintenance

Fire Life-Safety Related Dampers that are properly applied equipped with the appropriate UL Labels are 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.

Generally there are two distinctly separate types of Fire and Smoke Dampers:

- **Fusible Link Operated Dampers:** Fire Dampers and Ceiling Radiation Dampers are usually held in an open position by a fusible link which is designed to melt at a certain temperature, allowing gravity or springs 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 buildings 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 MONTHS

All Smoke and Combination Fire/Smoke Dampers equipped with electric or pneumatic actuators should be cycled open and closed periodically. 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 once every six months**. 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 signaled to do so.

This six 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 test shall also be conducted under standby power.
- Dedicated systems shall be tested at least semi annually.
- Non dedicated systems shall 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 part of the semi annual testing of any Dedicated Smoke Control System.

Non Dedicated Systems are Smoke Control Systems that utilize part or 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 LEAST EVERY TWO YEARS AND OPERATE THEM EVERY FOUR YEARS

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 close) of fusible link operated dampers is recommended only every fourth year.

NFPA 90A (Standard for the Installation of Air-Conditioning and Ventilating Systems)

- **Recommends:** Each damper should be examined every 2 years to ensure 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 they close and are not held open by the airstream. Care should be exercised 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
 1. Fusible links (where applicable) shall be removed.
 2. All dampers shall be operated to verify that they close fully.

FIRE, SMOKE AND CONTROL DAMPERS

MAINTENANCE, TESTING AND INSPECTION RECOMMENDATIONS

3. The latch if provided, shall be checked.

4. Moving parts shall be lubricated as necessary

Price recommends that obstructions, dirt build up, and rust, or corrosion be removed using mild solvents or detergents. If needed, damper track and blade hinges may be lubricated with a dry lubricant such as Silicone Spray or TFE Dry Lube.

NOTE: Never use 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, Price recommends the following.

1. 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.
2. 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.
3. Check closure springs. If defective contact damper manufacturer to 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 PRICE

The preceding procedures are strongly endorsed by AMCA (the Fire and Smoke Damper Manufacturer's Trade Association) along with the following additional 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 Tests or Commissioning Procedure is recommended to ensure proper operation of all systems and components including Fire and Smoke Dampers. In any event appropriate steps 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 Damper should be inspected every two years

Previously stated recommendations call for the cycle testing of all motor operated dampers every six months, the operational

testing of smoke control systems every six to twelve months, and the physical inspection of all fusible link operated dampers every two 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 PRICE 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 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 test or inspection, a fire smoke damper actuator fails to operate properly the following steps should be taken to verify that the actuator, itself, is inoperable:

- Verify that appropriate power voltage of pneumatic air pressure is being supplied to the actuator.
- Determine what condition and specific control signal (from a thermostat, smoke detector, etc) is 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 manufacturer'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. PRICE 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.

FIRE, SMOKE AND CONTROL DAMPERS

MAINTENANCE, TESTING AND INSPECTION RECOMMENDATIONS

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, model number, ratings, date installed, date of commissioning and/or acceptance, location (including system or portion of system it is serving) and a list of recommended periodic inspections and testing. Space should also be provided to record observations made periodic inspection and testing as well as any corrective actions taken. Any replacement of actuator or other parts or 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.

References

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

- UL555 Standard for Fire Dampers
- UL555S Standard for Smoke Dampers
- UL555C Standard for Ceiling Dampers
- ULC S-112 Standard for Fire Dampers (Canada)
- ULC-S112.1 Standard for Smoke Dampers (Canada)
- Marking and Application Guide - Dampers for Fire Barrier and Smoke Applications & Ceiling Dampers

Recommended Replacement Parts

Model:

- **FSD** - Fuse Links of Appropriate Temperature (If dampers are shipped with fuse links). It is suggested that an extra actuator of the kind supplied on the job be on hand for immediate replacement in the event one is found to be inoperable, since this is Life Safety Equipment.
- **FD, FDD** - Fuse Links of Appropriate Temperature.
- **SSD** - It is suggested that an extra actuator of the kind supplied on the job be on hand for immediate replacement in the event one is found to be inoperable.
- **CCD** - There is nothing suggested having on hand for these products due to they are not considered Life Safety Equipment. If a part breaks or an actuator is found inoperable, time allows for search of replacement parts.
- **CFS, CD** - Fuse Links of Appropriate Temperature.

Locations:

3-571 Chrislea Road, Woodbridge, Ontario Canada L4L 8A2. Ph:905.669.8988 Fax: 905.669.8023
12944 - 148 Street, Edmonton, Alberta Canada T5L 2H8. Ph: 780.477.9231 Fax: 780.477.3701

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