THE AMCA FIRE AND SMOKE
DAMPER TASK FORCE

The Case for Allowing **Remote Testing of Life-Safety Dampers**

Fire-resistance-rated construction, which compartmentalizes buildings into fire and smoke zones, has been used for decades as part of a balanced approach to protecting lives and property during fire events. Of course, when constructing a building, it is necessary to penetrate rated walls and floors with doors, HVAC ducts, pipes, conduit and other utilities. Each of these penetrations must be protected in order to maintain the integrity of the rated construction. Building codes require penetrations caused by duct and air transfer openings to be protected by fire, smoke or combination fire-smoke dampers. These products are often grouped together under the term "life-safety dampers."

As with any mechanical device, life-safety dampers must be periodically tested to confirm that they are operating properly. This article will discuss the current requirements for testing life-safety dampers, as well as proposed changes that would make the testing of actuated life-safety dampers quicker, more feasible, more frequent and less evasive, thus adding to the overall safety of our buildings.

CURRENT PERIODIC TESTING REQUIREMENTS FOR LIFE-SAFETY DAMPERS

Both the International Fire Code (IFC)[1] and the National Fire Protection Association (NFPA) Life Safety Code (NFPA 101)[2] require that fire dampers be periodically tested in accordance with NFPA's Standard for Fire Doors and Other Opening Protectives (NFPA 80).[3] Both codes also require that smoke dampers be periodically tested in accordance with the association's Standard for Smoke Door Assemblies and Other Opening Protectives (NFPA 105).[4] Combination fire-smoke dampers are required to be tested in accordance with both standards.

The periodic testing requirements for life-safety dampers in NFPA 80 and NFPA 105 are very similar. Both standards require that life-safety dampers be tested one year after installation and then every four years after that, with the exception of buildings that contain a hospital. For these, the test frequency is once every six years. Test requirements themselves are straightforward: the standards simply require confirmation that the damper is able to fully open and close as designed. With actuated dampers, this is accomplished by applying power to the actuator to open the damper blades, then removing power from the actuator to allow its spring to close the damper blades. Note that all smoke and combination fire-smoke dampers are required to have an actuator. Fire dampers can also be supplied with an actuator, but it is not required and is relatively rare. Non-actuated fire dampers must have the heat-response device actuated or removed so that the damper is shown to fully close. Then the damper must be reopened and the heat response device reinstalled or replaced.

Figure 1. Blocking access doors to smoke dampers, in this case wall framing members, can make testing and maintenance disruptive and expensive. *Image courtesy of David Sellers, PE, Facility Dynamic Engineer.*

Once an initial inspection or commissioning of a life-safety damper has been performed, the use of damper position indication devices can safely and effectively be used to confirm that the damper is continuing to function properly.

In addition to the requirements of NFPA 80 and 105, smoke and combination fire-smoke dampers that are part of a smoke control system must be tested with the rest of the smoke control system. The periodic testing of smoke control systems is governed by the Standard for Smoke Control Systems (NFPA 92).[5] The frequency of the NFPA 92 periodic testing requirements depends on whether the smoke control system is dedicated (used only for smoke control purposes) or non-dedicated (used for both general HVAC and smoke control). Dedicated smoke control systems must be tested every six months, and non-dedicated systems are required to be tested every year.

METHODS OF CONFIRMING PROPER OPERATION: VISUAL AND REMOTE

Besides the frequency of the testing, the primary difference between the NFPA 80 and 105 requirements and the NFPA 92 requirements is the method by which the operation of the dampers is required to be confirmed. NFPA 80 and 105 require visual confirmation of the opening and closing of life-safety dampers. This applies to both actuated and non-actuated dampers. Building codes require that each life-safety damper be provided access large enough to permit inspection and maintenance of the damper. Codes also require that those access points be permanently identified.

Despite these access and identification requirements, visual inspection of life-safety dampers can be exceedingly difficult to perform. Life-safety dampers are often installed well above the ceiling and sometimes behind obstructions such as ducts, pipes and conduit (see Figure 1). In addition, many life-safety dampers are in relatively small ducts (12 in. x 12 in. or less). This can add to the difficulty of visually confirming that a damper opens and closes properly.

NFPA 92 does not require visual confirmation. As a result, most NFPA 92 life-safety damper periodic testing requirements are met by cycling power to the damper and remotely confirming that the damper is able to open and close properly by monitoring a position indication device. Damper position indication devices are designed with one switch that closes when the damper blades fully open and a second switch that closes when the damper blades fully close. This can be accomplished by using switches built into the actuator or stand-alone switch packages that are tied to the damper blades (see Figure 2). In either case, the signal from the switches can be tied back to a control panel, fire alarm panel or building automation system (BAS) for easy confirmation of the damper's position.

ENFORCEMENT OF DAMPER TESTING REQUIREMENTS

The level to which life-safety damper periodic testing requirements are enforced varies by municipality and even more so by building type. In addition to the building inspections conducted by local authorities having jurisdiction (AHJs), health care facilities are inspected by the Center for Medicare and Medicaid Services (CMS). CMS-required inspections are often contracted out to organizations such as the Joint Commission, which accredits health care organizations. CMS and Joint Commission inspections require health care facilities to provide logs of the periodic testing of their life-safety dampers. As a result, adherence to the periodic life-safety damper testing requirements of NFPA 80, 105 and 92 in health care facilities is essentially 100 percent.

The same cannot be said for other building types. Many AHJs do not request that building administrators produce records of their life-safety damper testing. That fact, along with the shortage of maintenance personnel and, in many cases, the difficulty getting visual confirmation of life-safety dampers' proper operation, results in a lack of testing life-safety dampers in non-health-care facilities.

Figure 2. Typical damper position indication switch assembly. *Image courtesy of Greenheck.*

WHEN VISUAL TESTING SHOULD BE USED

In some cases, physically going to the damper to visually confirm its operation is the only option. For example, non-actuated fire dampers simply operate by way of gravity or a spring to close the damper's blades when a fusible link reaches its activation temperature. There is no way to remotely operate the damper.

The most common issues that prevent life-safety dampers from operating as designed occur during the building construction process. An improper installation is often the culprit. It is critical that dampers be installed square and plumb so their blades can freely operate without binding on the damper's frame. Another installation mistake is running screws into the linkage, connecting the damper's blades to each other.

It is also not uncommon for dampers to be tampered with during the construction of a building. For example, after a building's HVAC system becomes active but before power is supplied to a damper's actuator, construction workers may loosen an actuator's clamping mechanism so the space they are working in can be conditioned. If they do not remember to retighten the mechanism, the damper will stay open. Even after power is supplied to the actuators, dampers are sometimes propped open with a board or something similar to keep the space conditioned, guaranteeing failure in a fire event.

Because of these issues, it is critical that dampers be visually tested for proper operation during the building commissioning process. This process is also known as acceptance testing and is a precondition for turning the building over to the owner.

Suggested Reading

- "Fire/Smoke Dampers for Hospitals." AMCA inmotion (2014): 2–6.
- "Smoke Damper Testing and Maintenance for Service Life and Performance Assurance." AMCA inmotion (Summer 2012): 26–30.
- "Fire Dampers and Smoke Dampers: The Difference is Important." AMCA inmotion (Fall 2011): 20–23.
- "Dampers: An Essential Component of Fire Protection Design." AMCA inmotion (Spring 2010): 11–14.
- "Integrating Smoke Control Dampers and Fans." AMCA inmotion (Spring 2009): 14–17.
- "Fire Smoke Dampers Prevent Occupants from Getting the Shaft." AMCA inmotion (Spring 2008): 18–20.
- "Effective Smoke Control Using Dampers with Electric Fire/Smoke Actuators." AMCA inmotion (Fall 2007): 15–18.
- "Fire and Smoke Damper Trade-Offs – At What Cost?" AMCA inmotion (Fall 2007): 10–11.

WHEN REMOTE TESTING SHOULD BE ALLOWED

Once an initial inspection or commissioning of a life-safety damper has been performed, the use of damper position indication devices can safely and effectively be used to confirm that the damper is continuing to function properly. This information can be obtained from a single remote control panel or easily visible light indicator. As previously mentioned, remote testing of life-safety dampers is not permitted to meet the periodic testing requirements of NFPA 80 and 105. But that restriction is out of touch with today's damper designs and the capabilities of modern building automation and fire alarm systems. The language in NFPA 80 and 105 should be changed to allow periodic testing to be conducted remotely on actuated dampers that have passed an initial visual inspection confirming proper operation.

The Air Movement and Control Association (AMCA) International, an industry trade association of manufacturers, has proposed that NFPA 80 and 105 be modified to allow actuated dampers to be tested remotely. The proposal requires the following:

- That dampers are designed with the ability to remotely indicate when the damper is fully open and fully closed.
- That, prior to dampers being eligible for remote testing, an initial visual inspection take place. For new construction or installations, this would most commonly be done during the commissioning process.

If AMCA's proposal is accepted, any problems that occur after a damper's initial inspection would be identified during the remote testing. This is because the position indication device would detect that the damper is unable to reach its full open or full closed position—an indication to the building's maintenance staff that the damper needs to be physically inspected.

CONCLUSION

Due to a lack of enforcement, lack of manpower, messy clean up after access through ceiling compartments and the difficulty in performing visual inspections on many dampers, the required periodic testing of life-safety dampers is often not performed. Allowing remote inspections would dramatically reduce the difficulty, time and subsequent cost associated with performing these tests. This in turn would result in a higher percentage of dampers being periodically tested and thus safer buildings.

REFERENCES

1. International Fire Code. Washington, DC: International Code Council, 2012.
2. NFPA 101. Life Safety Code. Quincy, MA: National Fire Protection Association, 2015.
3. NFPA 80. Standard for Fire Doors and Other Opening Protectives. Quincy, MA: National Fire Protection Association, 2016.
4. NFPA 105. Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives. Quincy, MA: National Fire Protection Association, 2016.
5. NFPA 92. Standard for Smoke Control Systems. Quincy, MA: National Fire Protection Association, 2015.