In the Line of FIRE

RUSKIN®

Controlled Closure Fire/Smoke Damper Design Eliminates HVAC Duct System Damage

By: Richard Cravy **December 2002**

HVAC duct system damage, due to instantaneous closure of dampers, is a potential problem and concern of design engineers and contractors. Laboratory tests prove extreme pressures occur upstream and downstream of instantaneous closing dampers. These extreme pressures support the concern for potential duct disruption or collapse. In 1991, SMACNA was concerned about collapsing ductwork during startup tests at job sites. As a result they petitioned NFPA to amend the NFPA 90A Installation of Air Conditioning and Ventilating Systems Standard to eliminate the test of fire/smoke dampers under air flow conditions. Section 5-3.2 of the NFPA 90A now states "Acceptance of fire protection devices in air conditioning and ventilation systems shall, as far as practical, be done under normal operating conditions. This language eliminates a startup test of dampers under air flow if potential duct damage is probable. In addition, the 1993 ASHRAE Research Project RP 680 Fire/ Smoke Damper Study included a recommendation for additional research to study transient pressures in typical dynamic HVAC systems caused by instantaneous damper closure, in order to formulate a design criteria for duct designers.

Figure 1 depicts the collapse of the duct due to the mass of air flowing at 4000 fpm duct velocity when instantaneous closure of the damper occurred. Figure 2 illustrates how the combined positive upstream pressure and negative downstream pressure exceeded a total of 21 inches during this test.

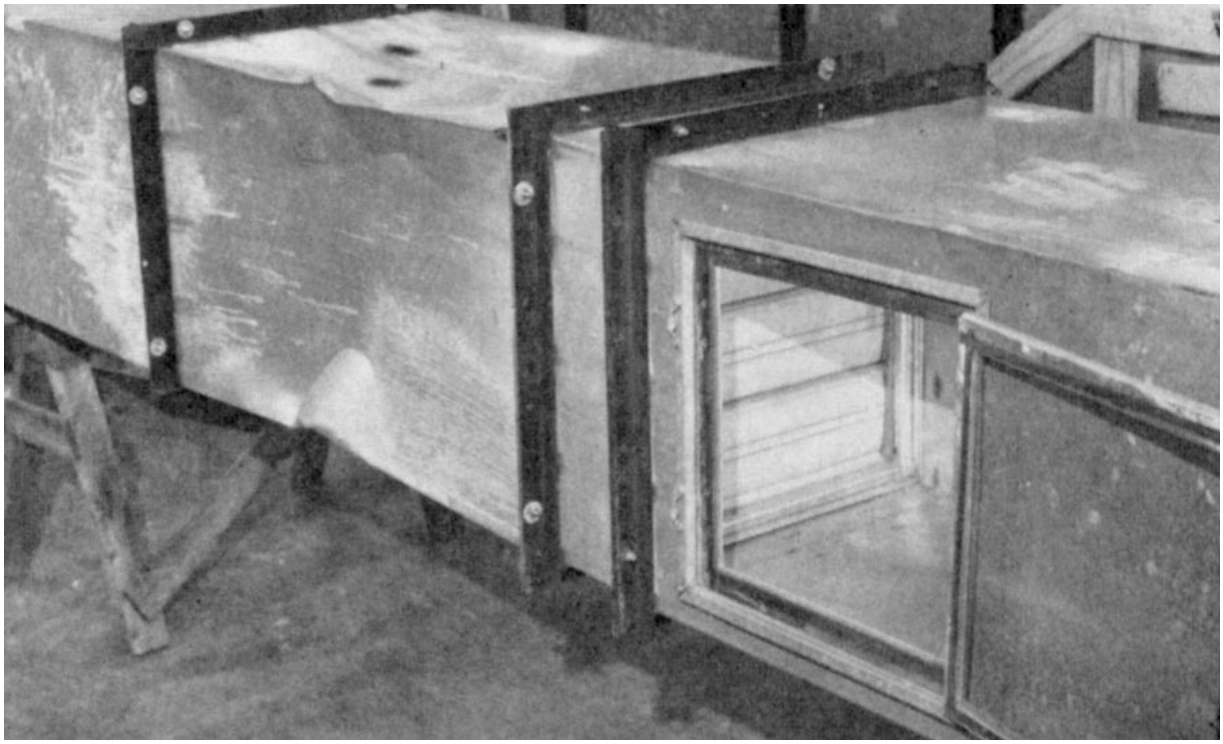

Figure 1
Duct damage caused by instantaneous damper closure.

Until July 1, 2002, Ruskin was the only fire/smoke damper manufacturer who, as part of their design, used controlled closure devices on their fire/smoke dampers. Other manufacturers utilized fuse links or bi-metallic links to close the dampers instantaneously (see figure 3). **Effective July 1, 2002, UL555 and 555S requirements forced all manufacturers to change their designs to utilize control closure devices on multi-section fire/smoke dampers. Some manufacturers,**

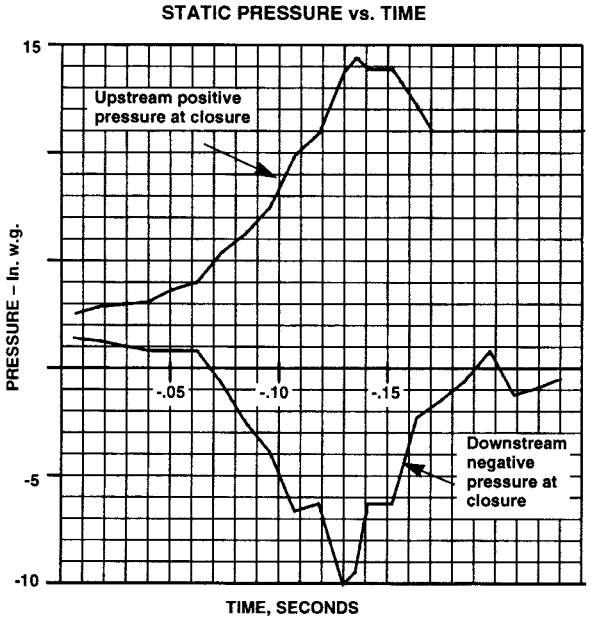

Figure 2
Static Pressure vs. Time

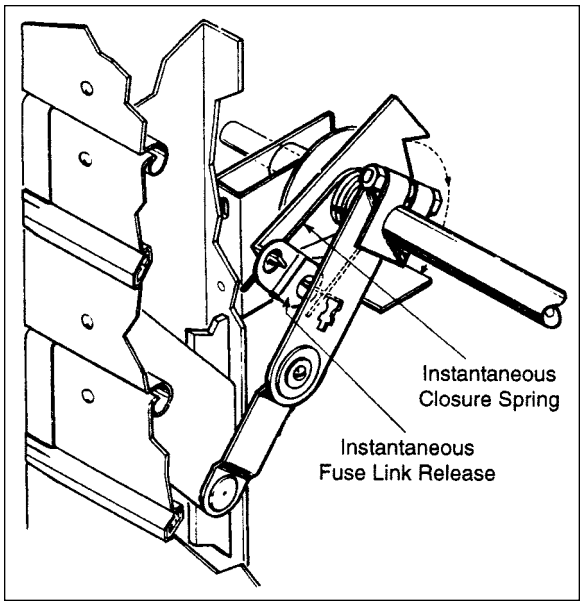

Figure 3
Instantaneous Disconnect Closure Design

however, still use instantaneous closure devices on single section dampers. These dampers should not be considered an option because instantaneous closure pressures far exceed the design static pressure of most duct systems and can result in costly repair and down time.

Ruskin controlled closure design allows the damper to open and/or close in 7 to 15 seconds, meeting any or all code requirements. Ruskin uses the electric or pneumatic actuator return springs to close and lock the damper. The damper never disconnects from the actuator. Instead, Ruskin de-energizes the electric actuators or shuts off air pressure to pneumatic actuators, for power-open/fail-close operation. Ruskin's EFL (electric fuse link) and PFL (pneumatic fuse link) design includes locking linkage, ensuring the damper remains closed throughout the extreme temperatures of a fire.

Ruskin eliminated the fusible links that instantaneously disconnect the spring loaded damper from the actuator and the potential for costly duct system repair.

A couple of other benefits of the Ruskin EFL/PFL are:

1. The EFL incorporates a push button for easy reset if the damper closes because of nuisance high heat (not related to fire).
2. The EFL/PFL allow the fire/smoke dampers to be installed in all positions (except vertical blades). This eliminates field coordination if limited space conditions exist.

Conclusion:

The use of Ruskin fire/smoke dampers eliminates the potential for costly duct system repair or replacement due to instantaneous closure. Not all fire/smoke damper manufacturers utilize controlled closure devices on all their fire/smoke dampers. Be certain by specifying Ruskin fire/smoke dampers.

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