

Basic Fire and Smoke Actuators & Dampers



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Basic damper and actuator concepts



UL555 (fire dampers)







At 165°F (typically) a fusible link melts and the blades drop down or are pulled down by a spring (horizontal or dynamic airflow).

Courtesy of Pottorff



UL555S (smoke dampers)



Courtesy of Pottorff



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UL555 Listed Assembly



Smoke Damper – no temperature limit. Controlled by smoke detectors or indirectly via smoke control panel.

Combination Fire & Smoke







Actuators are tested as an assembly with the damper.

Not listed alone.

UL555(S) requires 75 second time.

Test covers leakage, high velocity closing, other functions.



Types of Systems



Two types of damper use – 1.Containment / Compartmentation

90% simply close to prevent smoke or fire spread.

2. Engineered smoke control

Applied in zone pressurization, stairwells, elevator shafts, lobby pressurization, atria and large spaces. Can be exhaust or pressurization to prevent smoke spread.



Compartmentation





Engineered Smoke Control Systems

Organized control of smoke movement rather than containment is required as indicted in lessons learned from past fires.

The total situation is considered.



Engineered Smoke Control Systems

Stairwell pressurization Atria smoke extraction **Elevator shaft pressurization** Ventilated lobbies **Corridor dampers Ceiling dampers** Shaft dampers **Duct dampers** Fire & Smoke doors **Smoke Extraction Shafts and Fans** Sandwich or building pressurization systems



Consultants will develop a rational analysis smoke control strategy

- 1. Sequence of operation
- 2. Detail the response to alarms. Manual stations will start purge or pressurization sequences in stairwells. Floor by floor sequence to contain smoke.
- 3. Positive Feedback and what the system should do if feedback is not received in the specified time.



Dedicated & Non-dedicated Smoke Control



Dedicated: no other function but smoke control. Non-dedicated may be a HVAC air handling unit.





Control



Control

Smoke Control can be managed by BAS or the Fire Alarm System

Some trend to shift to an integrated system - Fire protection and BAS combined.

UL864 required for Fire Alarms, not actuators or dampers.



Courtesy of HPAC Engineering



BAS or the Fire Alarm System can provide:

- **1. Hardware for operation**
- 2. Firefighter Smoke Control Station
- 3. Process logic to control devices
- 4. Monitoring
- 5. Initiation of automatic smoke control can come from smoke detectors, alarms, water flow switches in sprinkler pipes, or pull stations into the fire system.





Fire Fighters Smoke Control System:

The Front End of every smoke control system is the Fire Fighters Control Station:

LED's associated with every fan & damper

Manual overrides for every fan & Damper

Fans & dampers are typically tied to BAS

Information from dampers & fans is taken and processed by either the Fire or BAS system to control the correct fans & dampers at the right time.



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LOCAL SMOKE CONTROL

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Factory mounted smoke detector



Courtesy of Pottorff

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Basic Fire and Smoke Training





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Will need parallel wiring for two large section dampers.

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80% of dampers use this configuration. Single sensor, manual reset.







Basic Fire and Smoke Training





Standards & Codes



Codes and Standards



Vertical Shafts – fire-smoke dampers required at penetrations This is one of the the most important protection against smoke spread in a fire.

Elevator shafts and lobbies – sprinkler trade-offs exist in IBC, not UBC.

Corridors – derated requirement in IBC, not UBC. These are the escape paths. They should be protected. You are not safer in an IBC building.

Pressurized stairway – required in IBC and UBC. People must be able to escape fires.



UL555 & UL555S

- Damper manufacturer requirement
- High temperature test for 250F or 350F
 - Damper and Actuator
- Heated Air Flow test ensures actuator closes damper.
- Others for damper only: Drop test, salt spray, Leakage rating
- 75 second is the UL 15 time requirement. UBC required 15 seconds for some years.

Belimo is 15 seconds for FSLF and FSNF; 75 sec drive and 20 sec spring for FSAF.



NFPA

- 90A, B HVAC
- 92 Smoke Control Systems for atria and large spaces.
- 80 (fire) & 105 (smoke) doors and dampers

• TESTING REQUIREMENTS

Every 4 years per NFPA. Local codes vary. Hospitals every 6 years.



NFPA

- NFPA 80 is fire opening protectives fire doors and dampers
- NFPA 105 is smoke opening protectives smoke doors and dampers.
- **Testing requirements:**
 - At end of first year
 - Every 4 years
 - Except hospitals every 6 years.



Life Safety Standards and Codes are always changing and developing.

Trade-offs between levels of cost and safety will always exist. Different views exist.

Purpose of Life Safety is to <u>protect people</u>, not buildings. By protecting the building we protect people. First code to clearly state this was the 1997 UBC.

Codes and Standards are quite intensive a subject. Not covered here in any detail.



Actuator & Damper Replacement and Repair

- Codes require life safety systems be maintained in operating condition.
- Rules are mostly unwritten.
- Use common sense if it breaks, fix it.
- AHJ usually the Fire Marshal or Building Official – is the final authority on dampers and alarms.



Actuator & Damper Replacement and Repair

- NFPA 80 & 105 require maintenance and repair or replacement.
- UL accepts actuator replacement; does not regulate.
- Use Belimo or damper manufacturer instructions.
- Actuator should be UL555S Listed with the manufacturer.
- "Equal or Better" is required.
- Separate Belimo documents detail repairs on different types of dampers.



Balanced Strategy

Sprinklers Structural Compartmentalization Alarms Fire and Smoke Dampers Smoke Control Systems Maintenance



Indicator Lights and Aux Switches

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Indicator Lights

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Product & New Applications



Belimo F&S Product Line

FSLF 4 sq.ft.

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FSNF 12 sq.ft.





FSAF*A max 18 sq.ft.2-position 24, 120, 230 volt.24 VDC as well as AC

FSAFB24-SR 2-10Vdc Proportional





Underfloor HVAC Pressure Control





Stairwell Pressurization





Typically one damper and pressure sensor per 3 floors.

Stairwell pressurization allows occupants to safely exit the building, while firefighters can stage and safely access an upper level fire.



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Why Specify



Belimo Quality



- 1. 5 year warranty
- 2. Micro Controller: Actuator cannot burn out if stalled before full rotation is achieved.
- 3. Motor runs cool for a long life span.
- 4. DC Motor: No noise when holding.
- 5. Very low Current Draw
- 6. Steel cold-weld clamp: no shaft slip
- 7. Steel housing: rugged integrity
- 8. ISO 9001 Quality Control





- 1. Fire and Smoke actuators have been treated like a commodity item. This has resulted in poor quality and lifespan in the market.
- 2. Most specifications put the dampers in Duct Accessories.

Life safety should be treated with more respect.





THANK YOU

