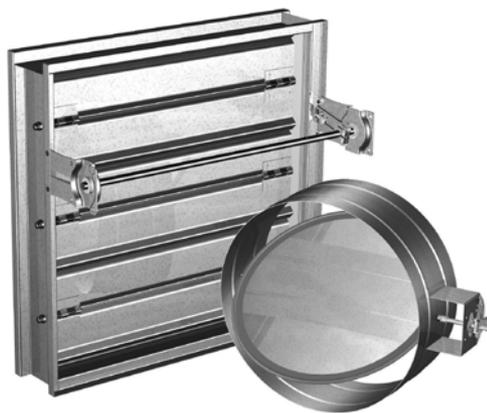
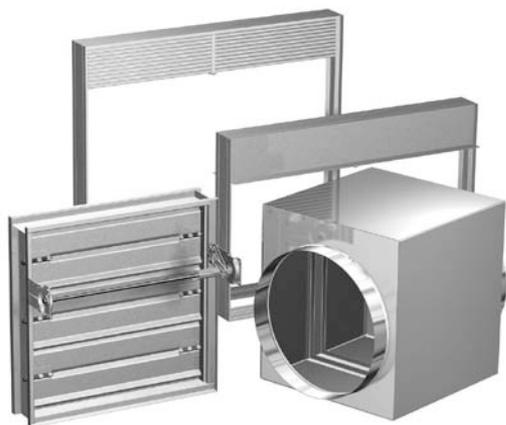


Fire, Smoke, and Combination Fire Smoke Dampers

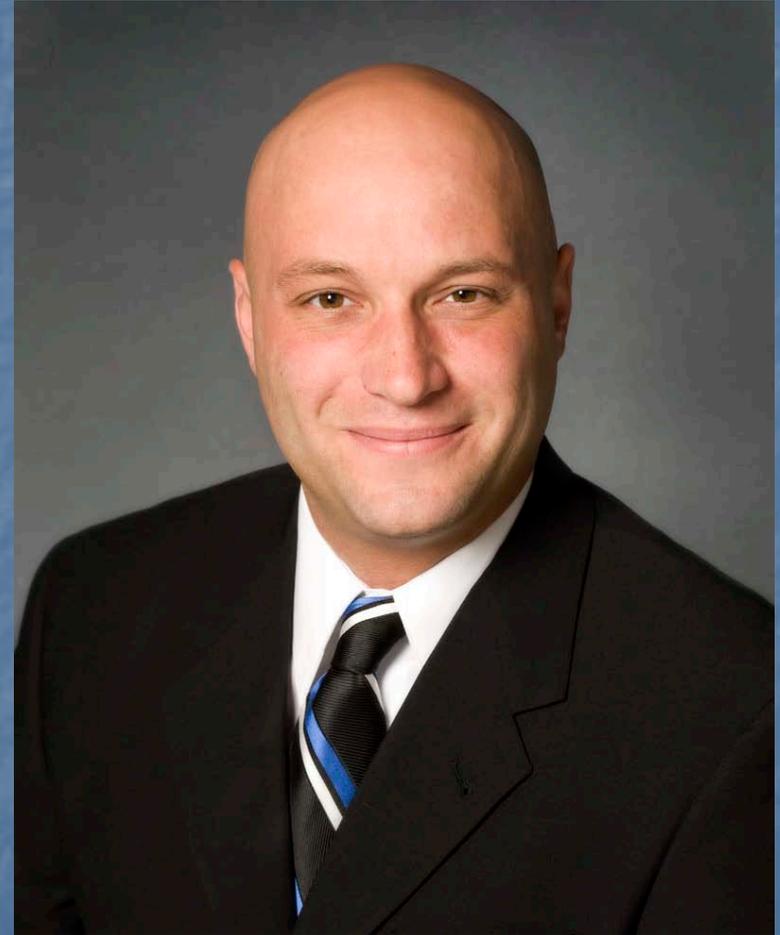


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Building Value in Air.

Mark Belke

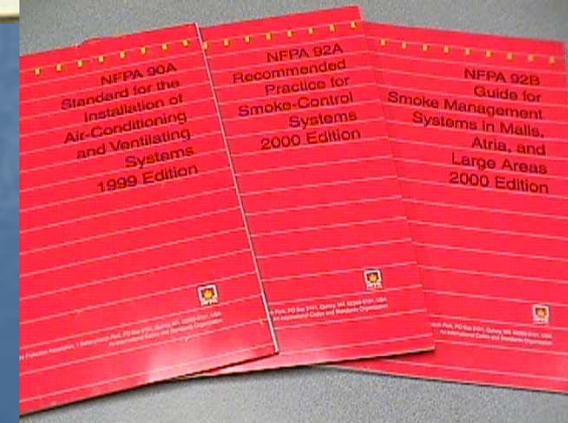
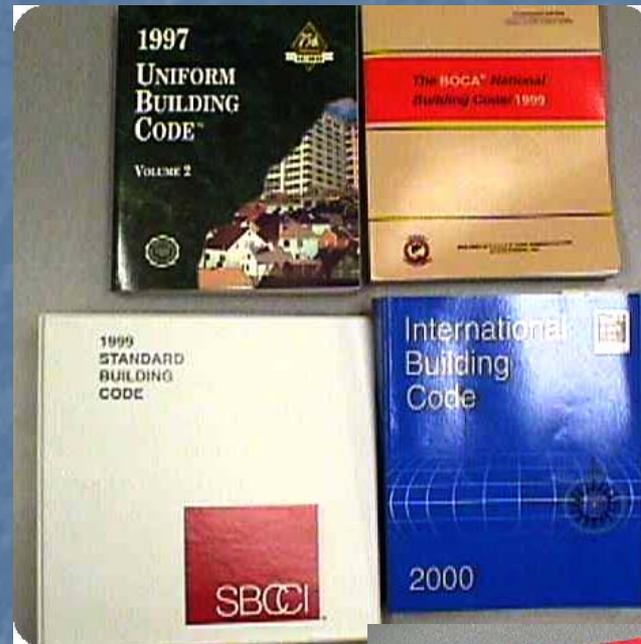
Director Damper Products-Greenheck

- Chairman of Code Action Review Committee (CARC)
- California Building Code work group
- NFPA 80A, 90A, 92B, 101, & 105
- California Energy Commission (PIER) Public Interest Energy Research



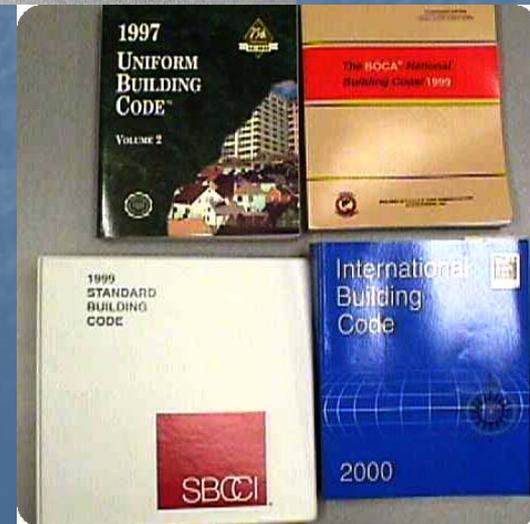
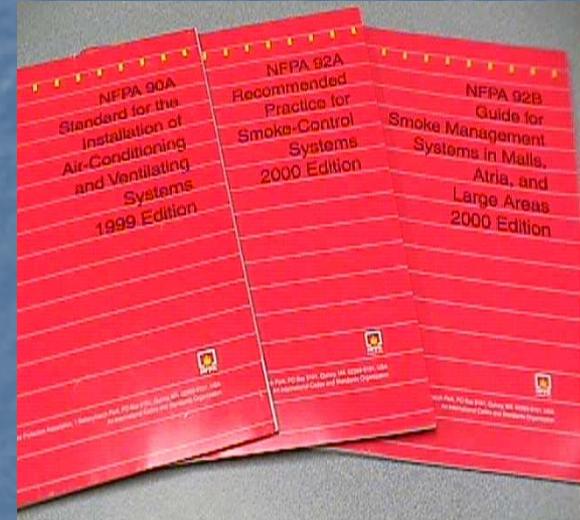
History of Design Guides & Building Codes

- 1913
 - NFPA 101, Safety to Life from Fires in Buildings & Structures
- 1915
 - BOCA Code
- 1927
 - UBC Code
- 1937
 - - NFPA 90A, Installation of Air Conditioning & Ventilating Systems
- 1945
 - SBCCI



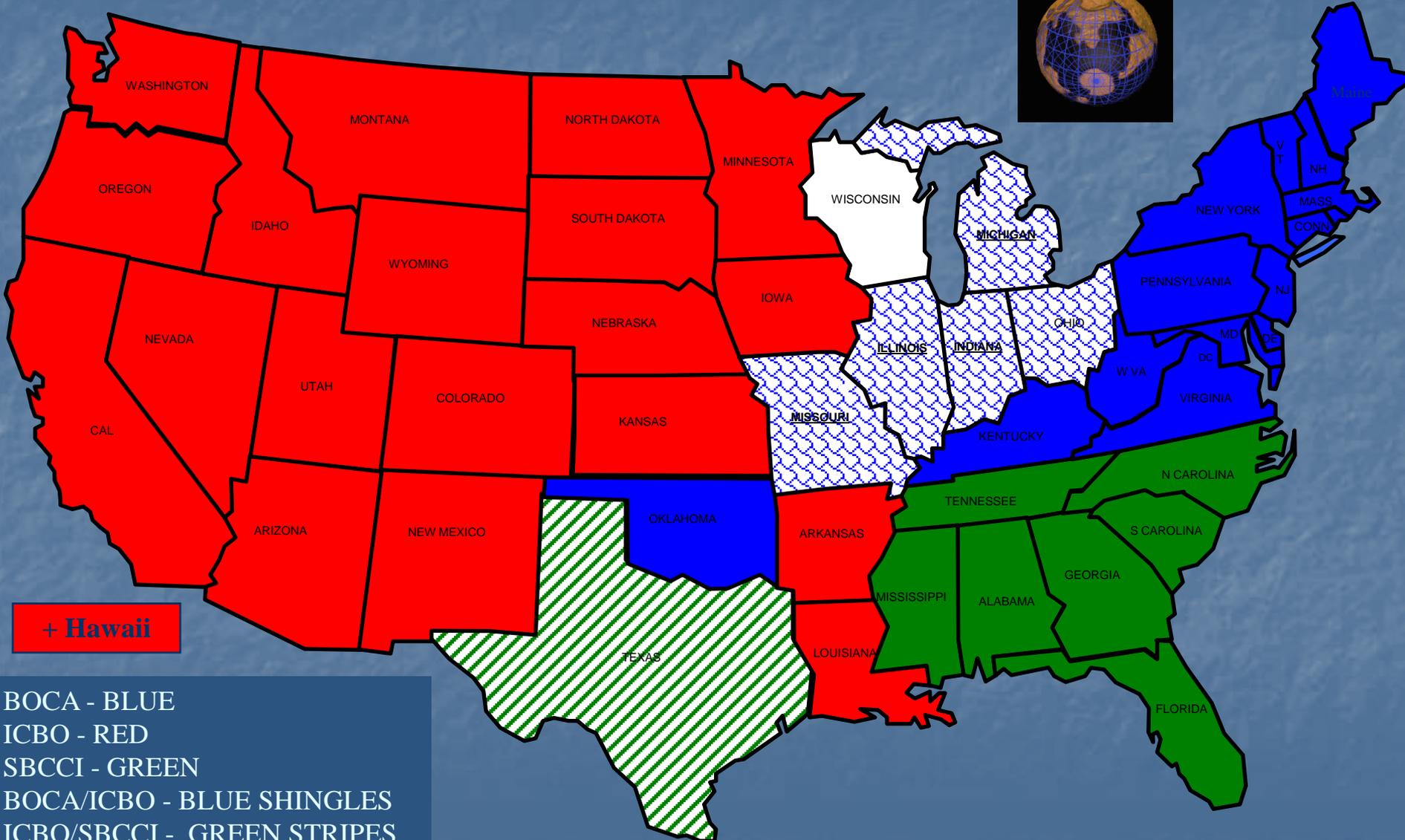
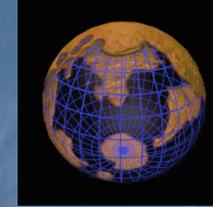
History of Design Guides & Building Codes

- 1985
 - NFPA 92A, Recommended Practice for Smoke Control Systems
 - NFPA 92B, Guide for Smoke Management Systems in Malls, & Large Areas
- 2000
 - IBC



2000 Regional Building Codes

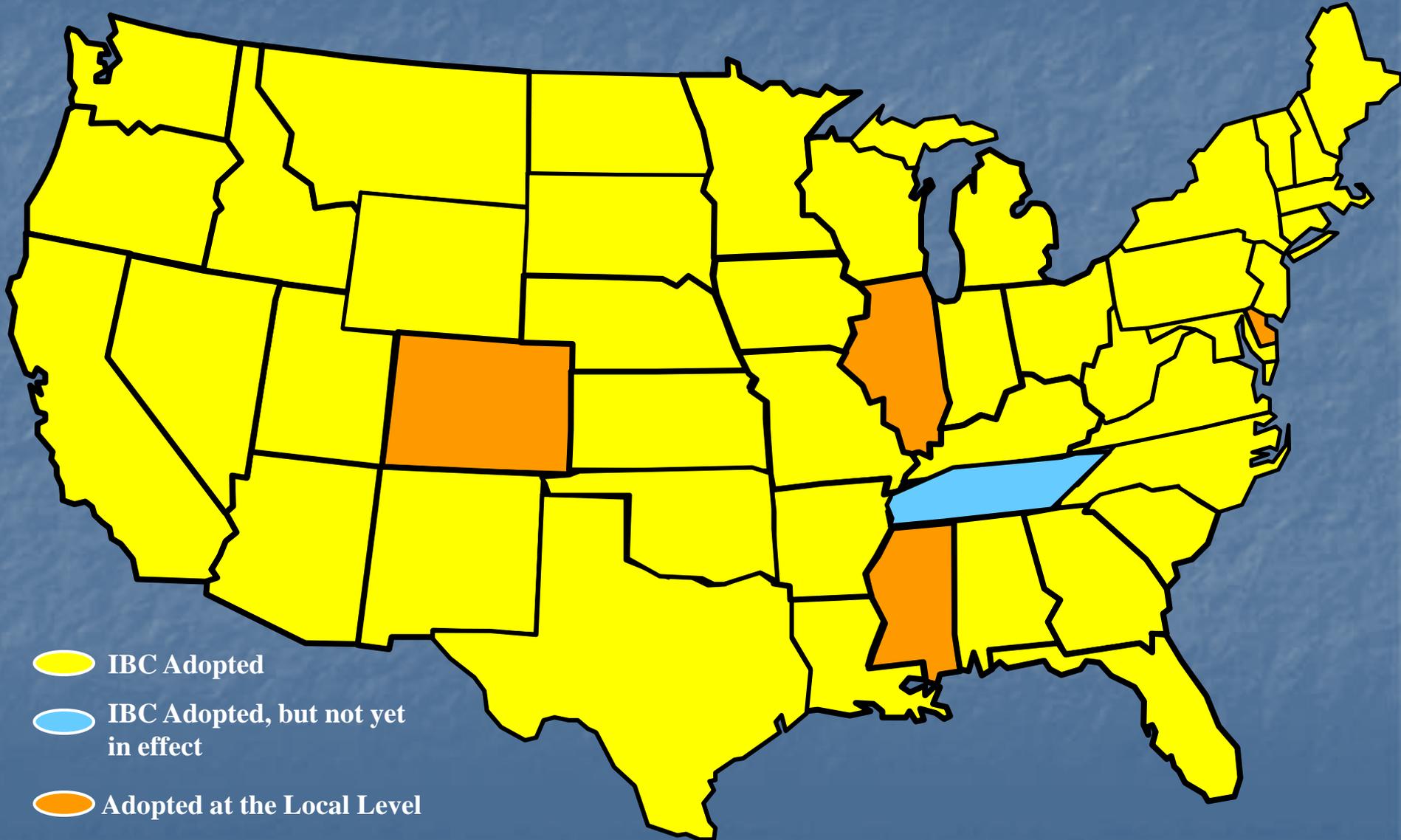
+ Alaska



+ Hawaii

BOCA - BLUE
ICBO - RED
SBCCI - GREEN
BOCA/ICBO - BLUE SHINGLES
ICBO/SBCCI - GREEN STRIPES
INDEPENDENT - WHITE

2007 Building Code (IBC)



-  IBC Adopted
-  IBC Adopted, but not yet in effect
-  Adopted at the Local Level

Introduction

- Codes
 - UL 555-standard for fire dampers
 - UL 555S-standard for smoke dampers
 - UL 555C-standard for ceiling radiation dampers
- Dampers must be tested in accordance with UL to gain approval

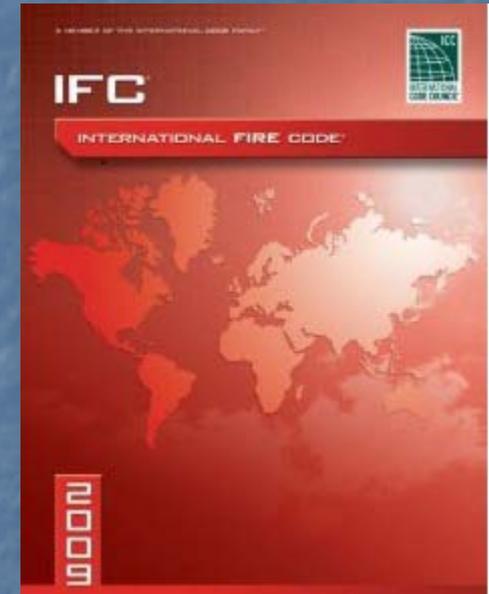
COMMISSIONING AND ACCEPTANCE TESTING OF NEW BUILDINGS

- Commissioning and/or acceptance testing is the inspection process to determine if all components of a new building are operating as intended by the building's designer.
- The proper operation of the components needs to be documented.
- Commissioning of a building establishes a baseline for the beginning of a periodic testing and maintenance program.

MODEL CODE REQUIREMENTS

■ International Fire Code (IFC):

- 2009:
 - Section 703.1.2 – Smoke dampers inspected and maintained in a accordance with NFPA 105.
 - Section 703.1.3 – Fire dampers inspected and maintained in a accordance with NFPA 80.
- 2006:
 - Section 703.2 – Opening protectives shall be maintained in accordance with NFPA 80.



NFPA 1 UNIFORM FIRE CODE

- Fire Dampers

- Section 61.4.2.1.3 – Fire dampers shall be installed per manufacture's instructions and NFPA 90A.

- Smoke Dampers

- Section 12.9.5.2 – Only dampers designed and tested per UL 555 and UL 555S shall be installed.

NFPA 101 LIFE SAFETY CODE AND JCAHO

■ NFPA 101

- Section 8.5.5.4.1 – HVAC equipment and ductwork shall be installed per NFPA 90A and NFPA 105.
- Section 8.5.5.4.2 – Smoke dampers and combination fire smoke dampers shall be inspected, tested and maintained per NFPA 105.
- Section 9.2.1 – HVAC equipment and ductwork shall be in accordance with NFPA 90A.
- Section 9.3.1 – Smoke control systems shall be installed, inspected, tested, and maintained per NFPA 92A.

■ The Joint Commission (JCAHO)

- JCAHO accredits and certifies health care organizations. They use the NFPA standards in their own standards.

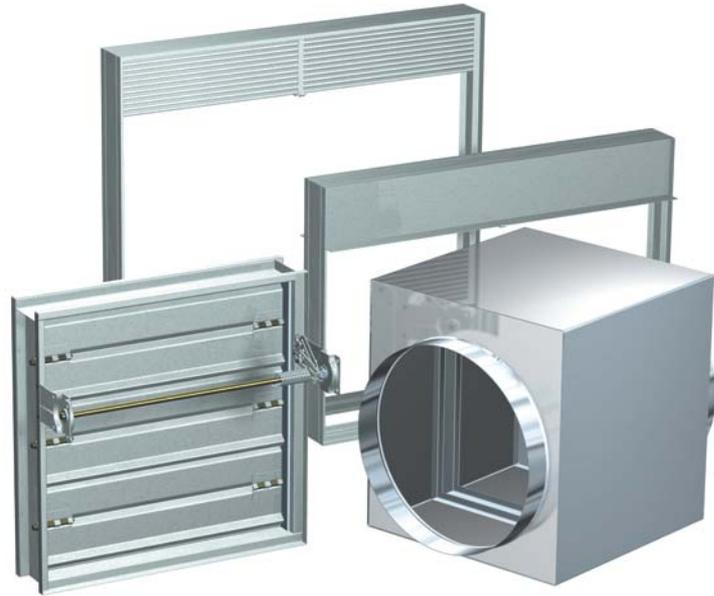
AMCA

- The Air Movement and Control Association (AMCA) is a international association of the world's manufacturers of related air system equipment. Most of the damper manufacturers are members of AMCA.
- AMCA recommends the following in addition to the requirements stated previously:
 - Cleaning (when required):
 - Obstructions, dirt build up, and any rust or corrosion on or around any damper should be removed.
 - Fuse Link Operated Damper Inspection:
 - Inspect fuse link and re-install or replace as needed.

AMCA

- Renovation and Remodeling Re-Commission and Acceptance Testing:
 - Repeating the original acceptance tests or commissioning procedure after a renovation or remodeling.
- Periodic Inspection:
 - Perform a visual inspection of a motor operated damper while performing the required cycle testing.
- Actuator Failure:
 - If an actuator fails during a periodic cycle test, replace the damper per the manufacturer's installation requirements.
- Record Keeping:
 - A record or log should be established for each fire or life safety related damper installed in a building.

UL 555: Fire Dampers



 **GREENHECK**
Building Value in Air.

Damper Ratings

- Closure Temperature
 - 165° F (minimum)
 - Operational Temperature (maximum)
- Operational Temperature
 - 250° F (minimum)
 - 100° F increments

Damper Ratings

- Operational Airflow Rating (400 fpm safety)
 - 2000 fpm
 - 3000 fpm
 - 4000 fpm
- Operational Closure Pressure Rating (.5 in. wg. Safety factor)
 - 4 in. wg.
 - 6 in. wg.
 - 8 in. wg.

Combination Fire Smoke & Fire Dampers - Ratings

- IBC

- 716.3.1 Fire Protection rating. Fire dampers shall have the minimum fire protection rating specified in Table for the type of penetration

Type of Penetration	Minimum Damper Rating (hours)
Less than 3-hour fire resistance rated assemblies	1.5
3-hour or greater fire resistance rated assemblies	3

UL 555 Classifications

■ Static

- for use in HVAC systems that shut off in case of a fire emergency

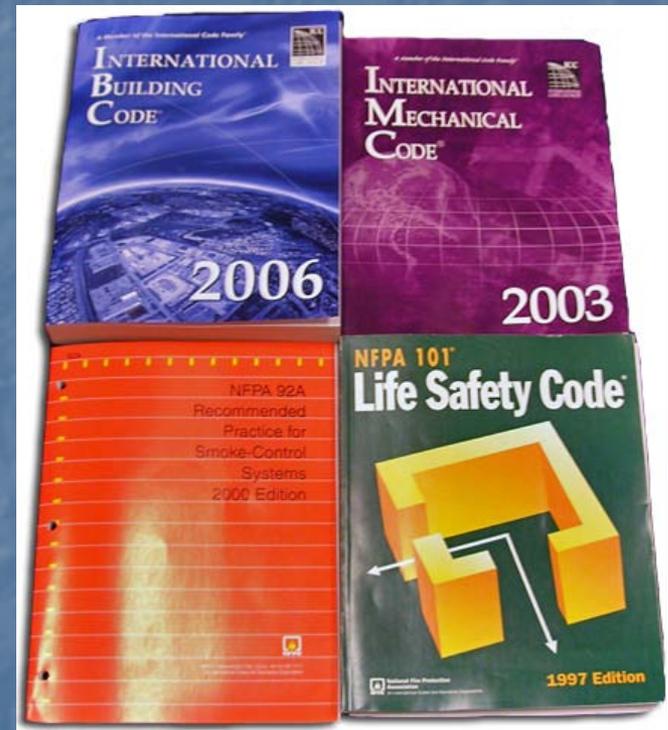
■ Dynamic

- for use in HVAC systems that continue running during a fire emergency
- dynamic airflow test
- increments of 1000 fpm



NFPA 90A

- Inspection & Testing
 - Each damper shall be examined every 2 years to ensure that it is not rusted or blocked.

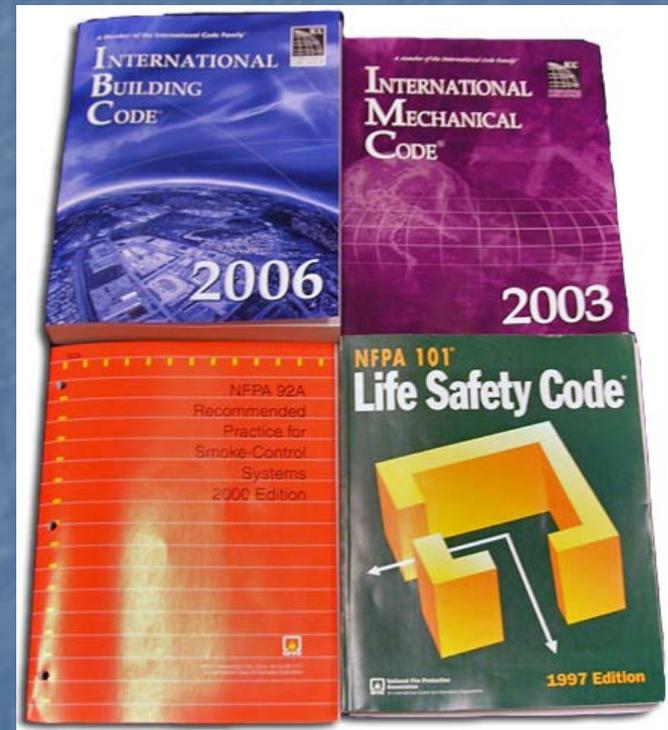


NFPA 92A

- **NFPA 92A Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences:**
 - Inspection of all fusible link operated dampers every 2 years.
 - Operate all fusible link operated dampers every 4 years.
 - Dedicated systems shall be tested at least semi annually.
 - Non-dedicated systems shall be tested at least annually.

NFPA 80

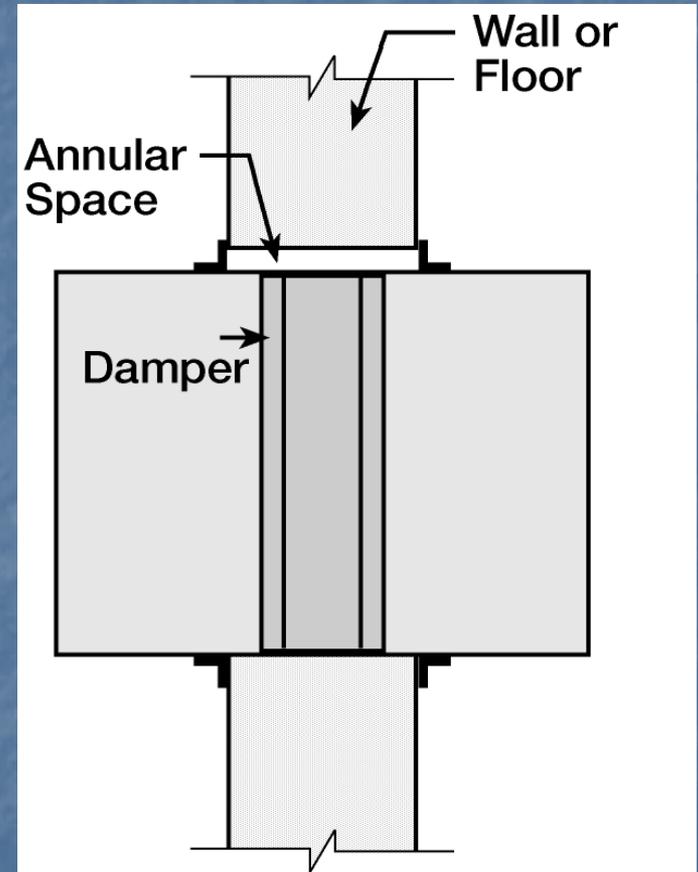
- Inspection & Testing
 - Each damper shall be tested and inspected 1 year after installation then every 4 years after except in hospitals which is 6 years



Fire Damper Installation

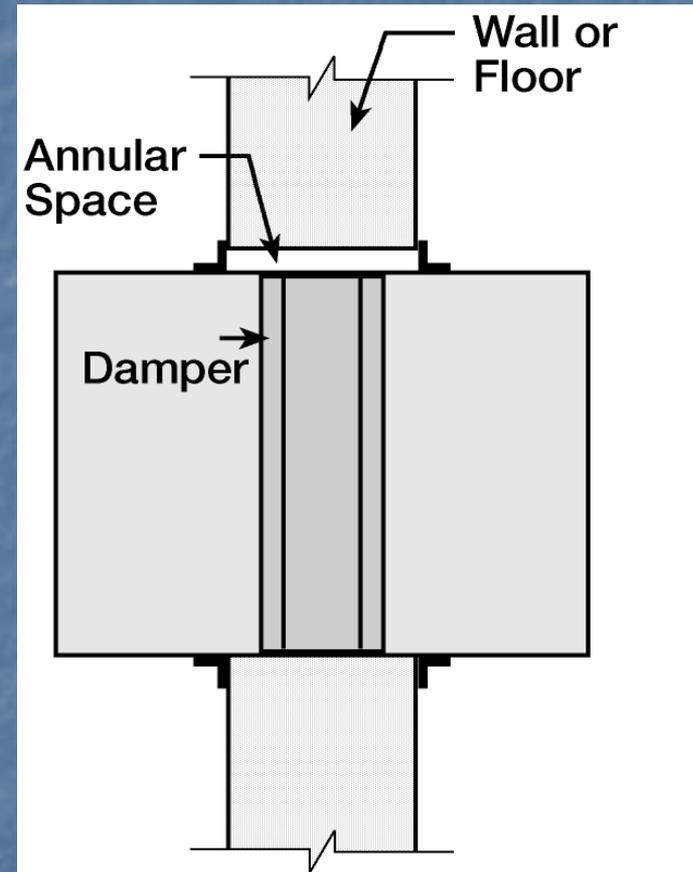
“Standard” Installation Requirements

1. The centerline of the damper must be within the plane of the wall.
2. The required thermal expansion clearances between the damper sleeve and wall/floor opening must be maintained. “Annular Space”



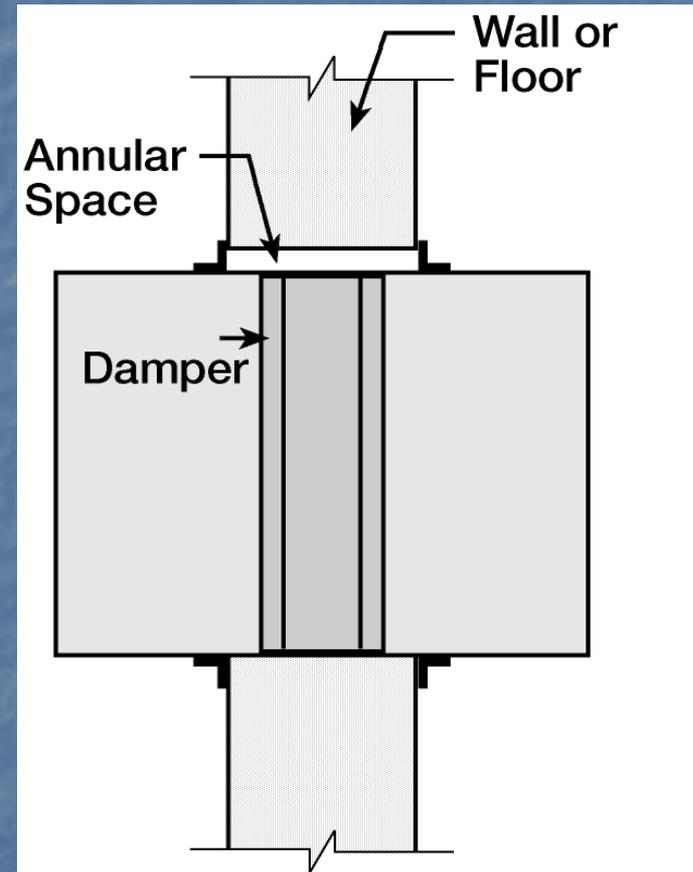
Fire Damper Installation

- Annular Space
 - space between damper and inside of barrier
 - 1/8" per linear foot
 - minimum: 1/4"
 - maximum: 3" on each side



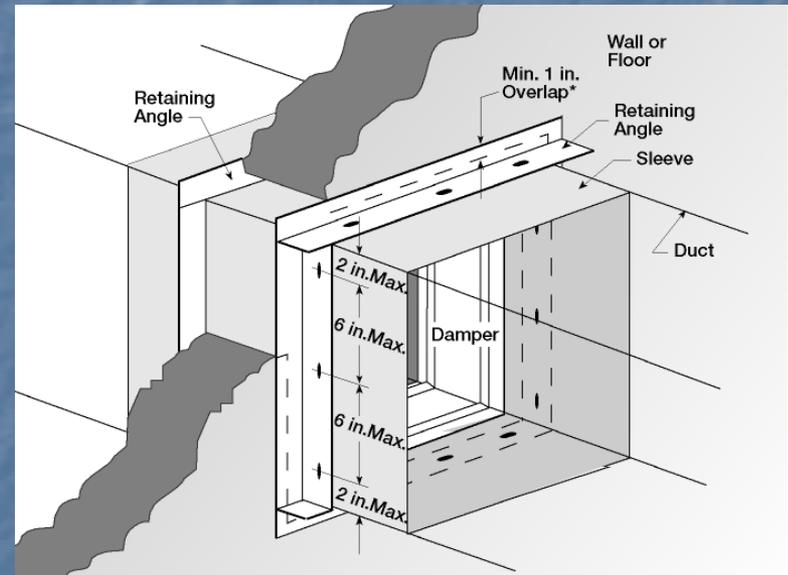
Fire Damper Installation

- Greenheck tests dampers **WITHOUT** any sealant or caulk in annular space
- Sealant is acceptable but must be approved by local authority



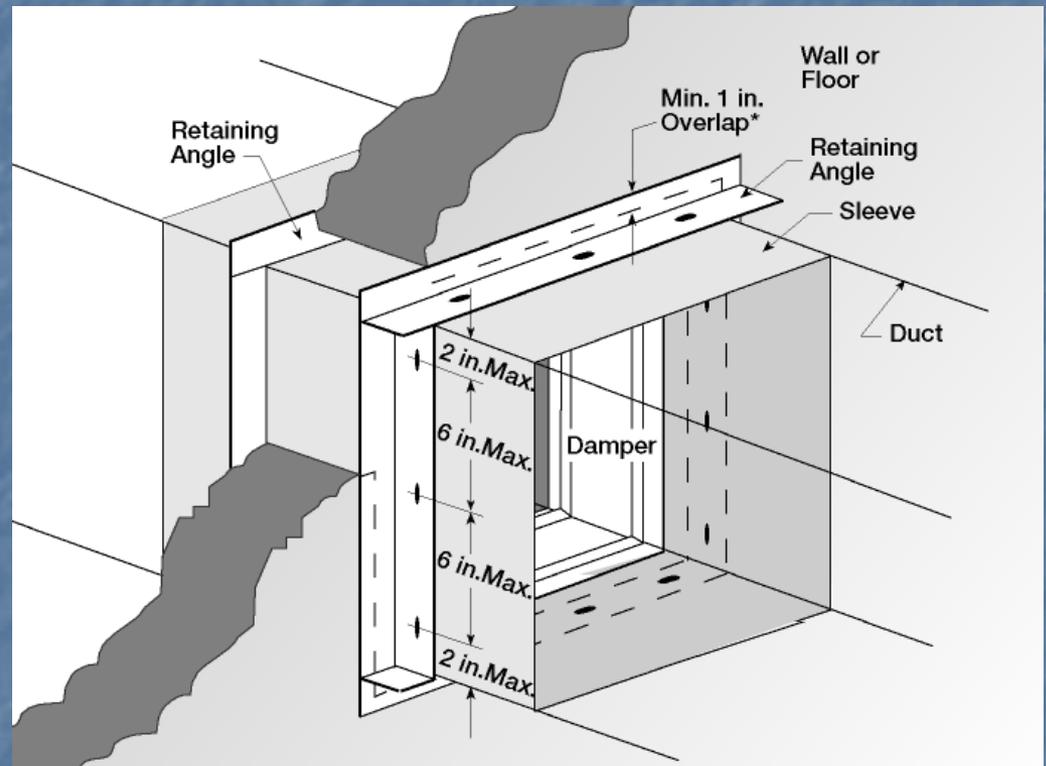
Fire Damper Installation

- Installed with sleeves
 - factory or field mounted
 - extend no more than 6" beyond the edge of the wall (16" if access door in sleeve)
- Location
 - centerline within the plane of the barrier



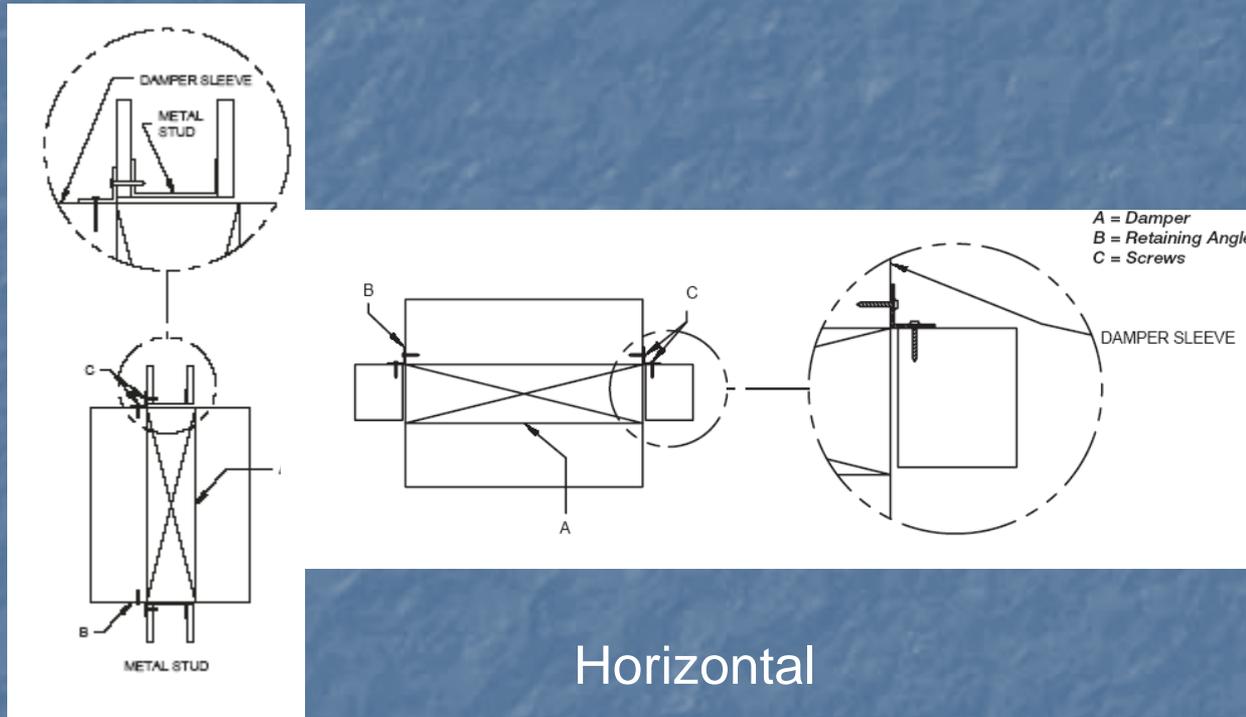
Securing Damper/Sleeve

- Retaining angles
 - Retain
 - Prevent sight-through
- 1 in. overlap of barrier



Single Side Retaining Angle

Single Side Angle-Vertical or Horizontal mount



Vertical

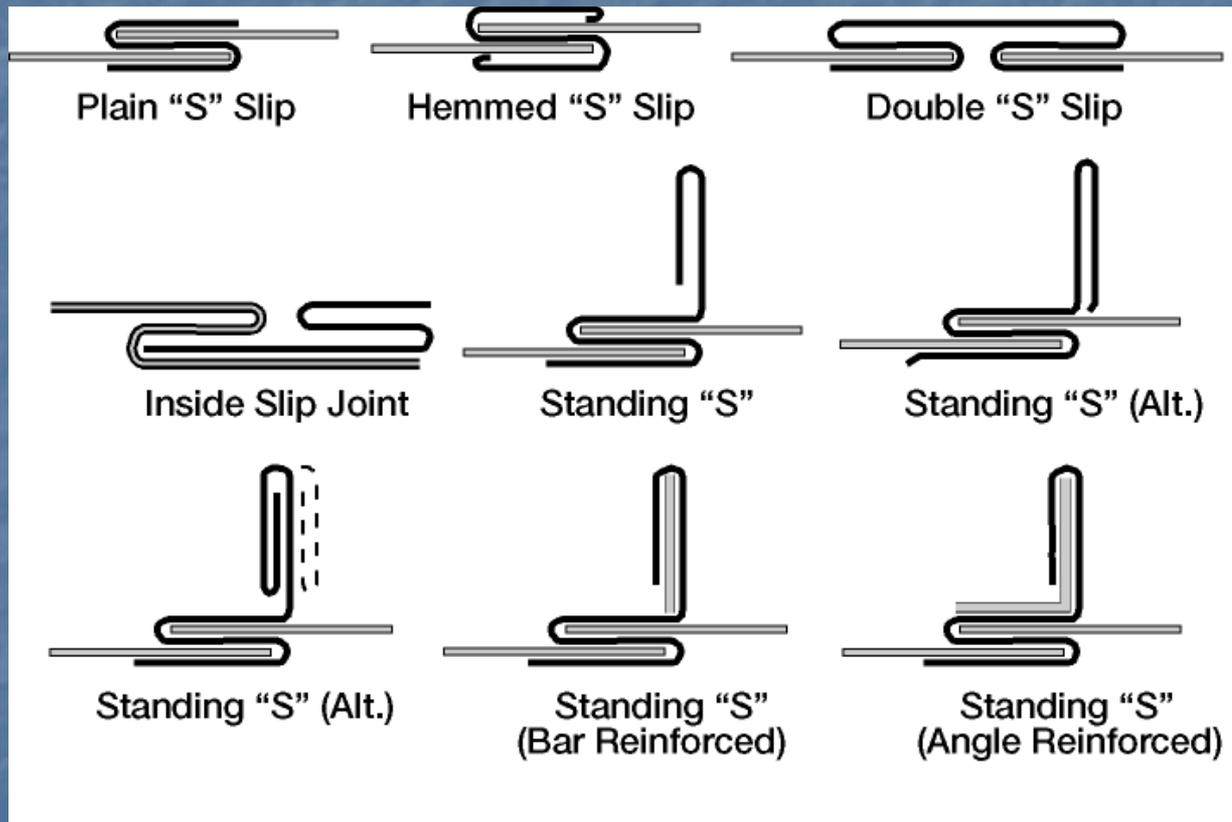
Horizontal

Breakaway Connections

- UL allows a number of duct connections:
 - Traditional
 - Manufactured
 - Proprietary
- Also shown in SMACNA, Fire Damper Guide

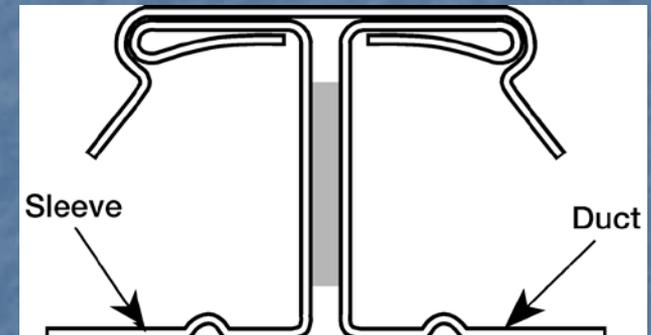
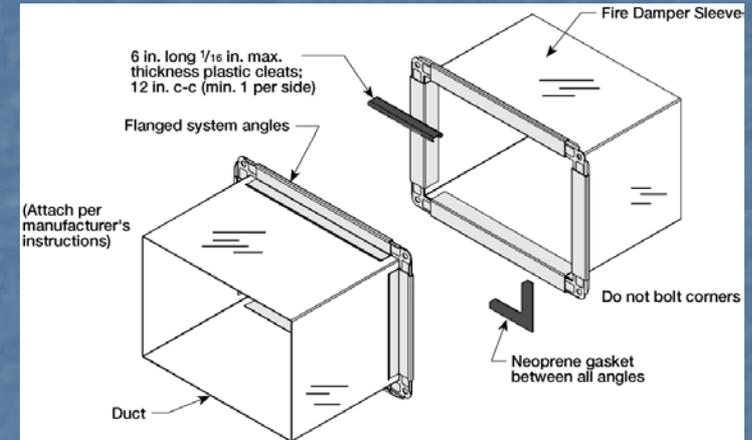
Breakaway Connections

- Traditional - Transverse Joints



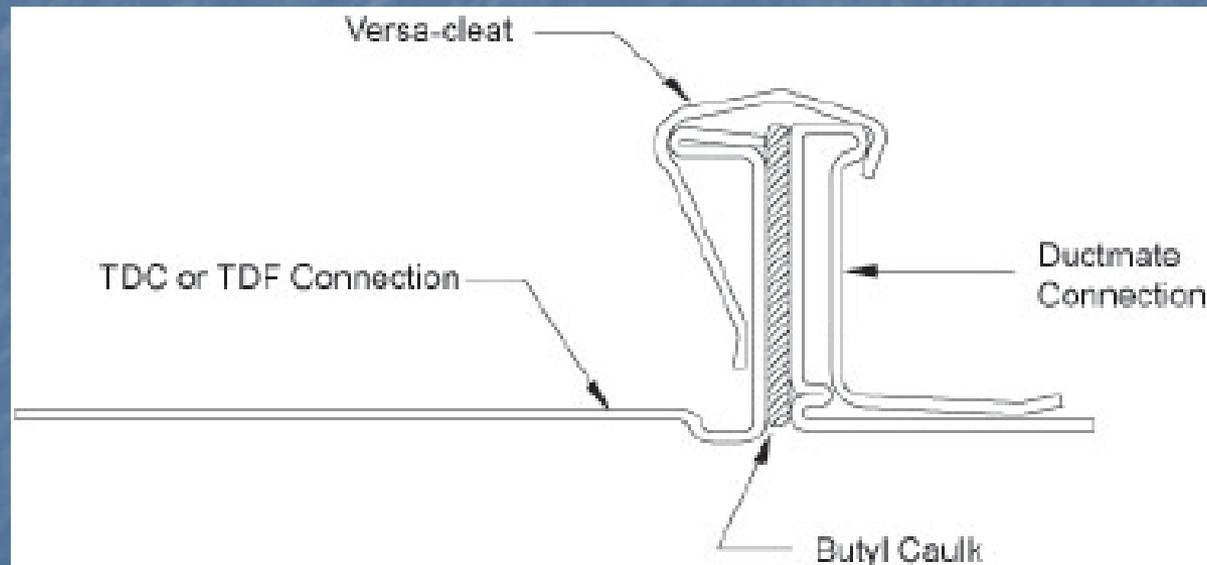
Breakaway Connections

- Manufactured
 - Ductmate
 - Ward
 - Nexus
- Proprietary
 - TDC by Lockformer
 - TDF by Engle



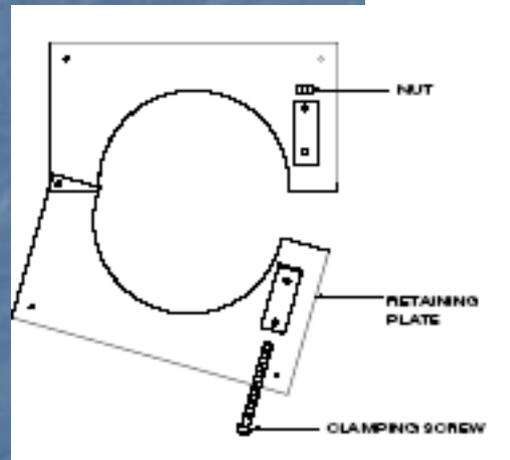
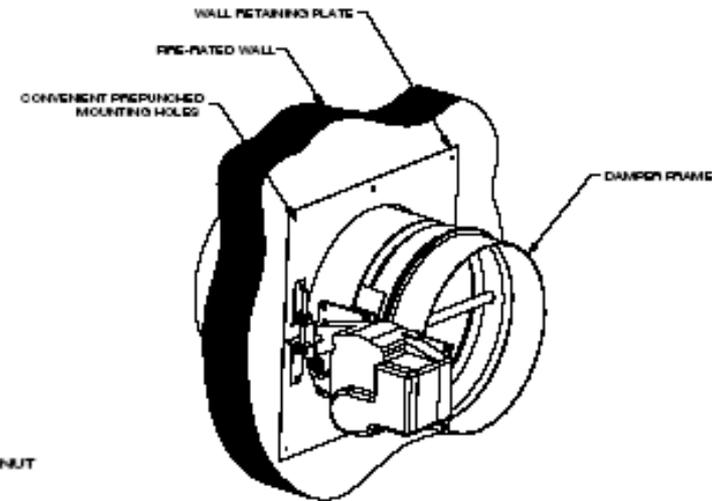
Breakaway Connections

- Ductmate, Ward, or Nexus to TDC or TDF



True Round Series

- One Retaining Plate required
- Two Plates optional
- True Round Series
 - DFDR
 - FDR
 - FSDR
 - SMDR



Firestop Installation

- Combination Fire Smoke Dampers
- Multi-blade Fire Dampers
- Underfloor applications
- Max. size 72" W x 96" H



UL 555S: Smoke Dampers



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DORSE
AND COMPANY, INC.
Manufacturers' Representatives

Smoke Damper Construction

- Type
 - multi-blade
 - 3-V or airfoil blade
- Construction
 - blade and jamb seals
 - *always* with a UL-approved actuator



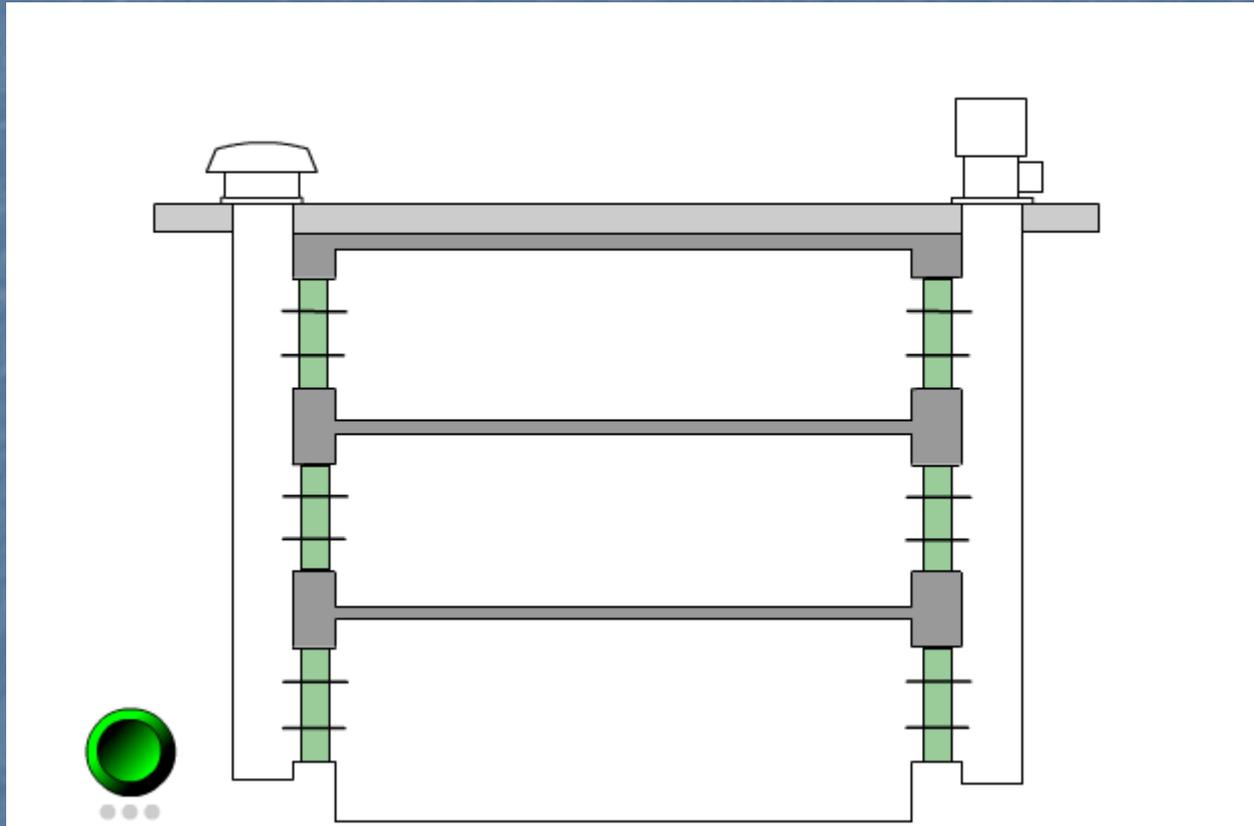
UL 555S Classifications

- Leakage Class
 - I (8 cfm/sq. ft @ 4 in.wg)
 - II (20 cfm/sq. ft @ 4 in.wg)
 - III (80 cfm/sq. ft @ 4 in.wg)
- Operational Temperature
 - Maximum operating temperature for damper
 - 250° F
 - 350° F

Smoke Damper Rating

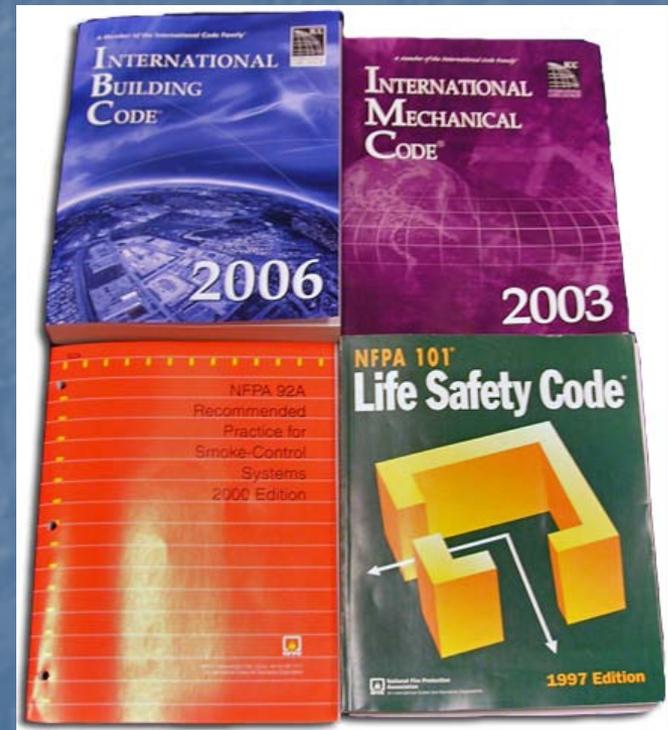
- IBC 716.3.2
 - Smoke damper leakage ratings shall not be less than Class II. Elevated temperature ratings shall be less than 250°F (121°C)

Engineered Smoke Control



NFPA 92A & 92B

- Inspection & Testing
 - Dedicated systems shall be tested at least semiannually
 - Non-dedicated systems shall be tested at least annually.



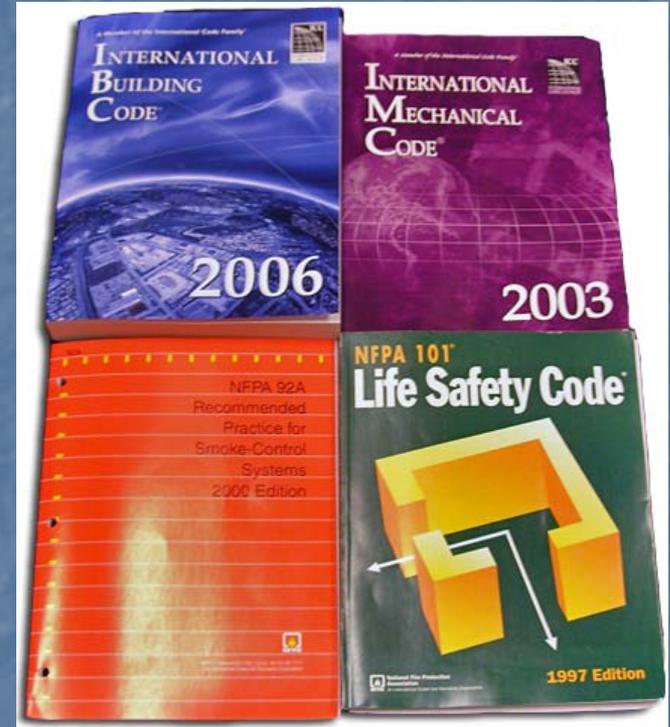
NFPA 105

■ Inspection & Testing

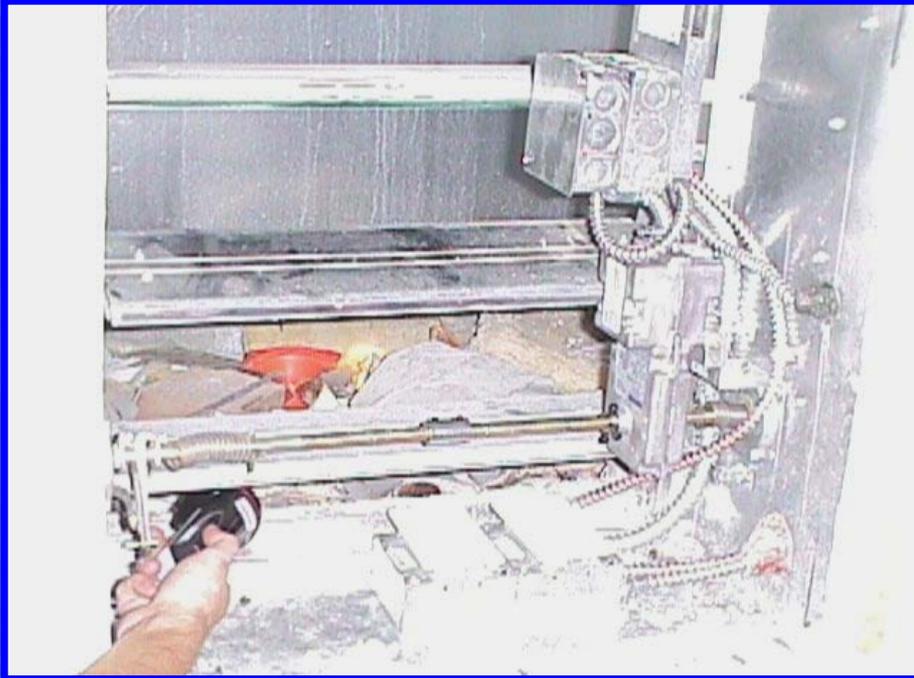
- Each damper shall be tested and inspected 1 year after installation then every 4 years after except in hospitals which is 6 years
- The damper shall be actuated and cycled as part of the associated smoke detector testing in accordance with NFPA 72.

■ Maintenance

- All maintenance shall be documented in accordance to section 6.5.10 & 6.5.11

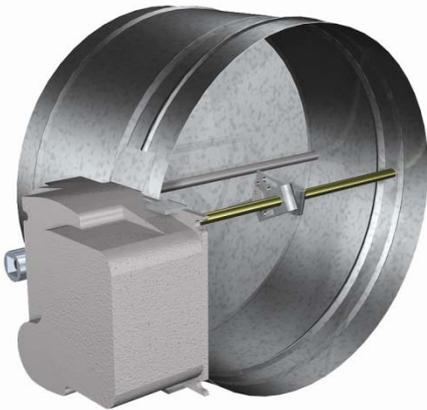


Incorrect Installations



- Garbage placed inside of damper.

Combination Fire/Smoke Dampers



Actuator Types

- Electric

- 24 VAC

- 120 VAC

- Transformer required on 208V, 277V, 460V



- Pneumatic

- 20-25 psi supply

- 60-80 psi supply



- Manual

- Quadrant type

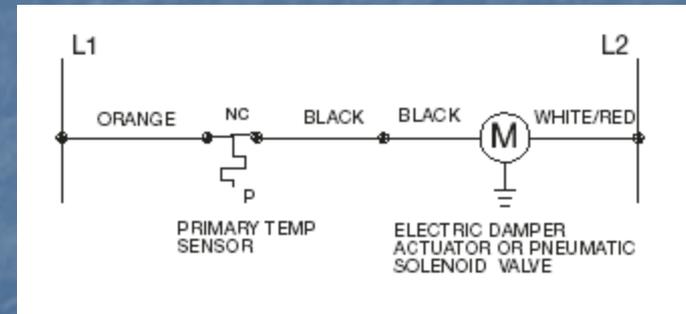
- Pull chain type



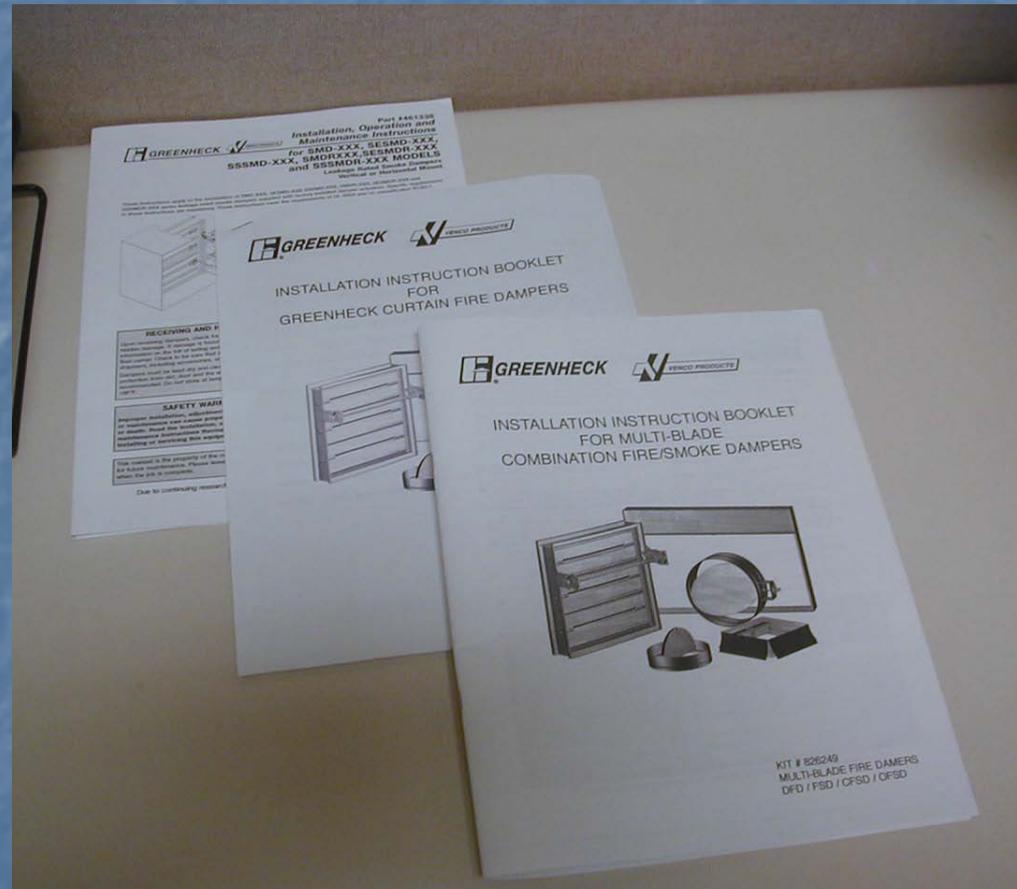
Fire/Smoke Damper Closure Devices

■ Electronic Link

- bi-metallic sensor
- wired in series with actuator
- cuts power to actuator when temperature is reached
- Greenheck's "RRL"



Installation Books



www.greenheck.com

Greenheck Fan Corporation - Products - Dampers - Microsoft Internet Explorer

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DAMPERS

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- Ceiling Radiation Dampers
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DAMPERS

NEW! [What's New in Dampers](#)
[Frequently Asked Questions](#)

[UL Listings for All Manufacturers \(Click on the "View Listing" link\)](#)
[AMCA Licensed Greenheck Dampers](#)

Greenheck offers a complete and comprehensive line of damper products for fire and smoke control in life safety systems and for airflow control in commercial HVAC and industrial systems.



Downloadable Greenheck Literature
Viewable with the Adobe Acrobat Reader
([Click here for more information or to download the Acrobat reader](#))

- [Damper All Products Brochure \(548k\)](#)
- [Dampers and Louvers: The Greenheck Advantage \(2.5M\)](#)
- [Severe Environment Dampers \(715k\)](#)

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Where Do I Find the UL Listings?



Online Certifications Directory

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Company Name	Category Name	Link to File
ACME ENGINEERING & MFG CORP	Dampers for Fire Barrier and Smoke Applications	EMME.R16596
ACTION AIR USA, DIV OF TOMKINS	Dampers for Fire Barrier and Smoke Applications	EMME.R16693
AIR BALANCE INC	Dampers for Fire Barrier and Smoke Applications	EMME.R4708
AMERICAN WARMING & VENTILATING	Dampers for Fire Barrier and Smoke Applications	EMME.R16398
ARLAN DAMPER CORP	Dampers for Fire Barrier and Smoke Applications	EMME.R8610
ARROW UNITED INDUSTRIES, DIV OF MESTEK	Dampers for Fire Barrier and Smoke Applications	EMME.R19235
BUCKLEY ASSOCIATES INC	Dampers for Fire Barrier and Smoke Applications	EMME.R9491
C&S AIR PRODUCTS	Dampers for Fire Barrier and Smoke Applications	EMME.R14981
DESCO PRODUCTS	Dampers for Fire Barrier and Smoke Applications	EMME.R6462
GREENHECK FAN CORP	Dampers for Fire Barrier and Smoke Applications	EMME.R13317
Guide Information	Dampers for Fire Barrier and Smoke Applications	EMME.GuideIn
GULF MECHANICAL ACOUSTIC MFG CO	Dampers for Fire Barrier and Smoke Applications	EMME.R20671

Where Do I Find the UL Listings?

Greenheck Fan Corporation

400 Ross Avenue

PO Box 410

Fire Dampers for Use in Dynamic Systems

Model	Hr Class	Damper Mounting Position	Single Section Damper Size In.		Multiple Section Damper Size In.	
			W	H	W	H
DFD-110(A), -150(A),	1-1/2	H	30	30	—	—
-155(A), -150X(A)		V	36	36	—	—
ODFD-110(A), -150(A)	1-1/2	V	36	36	—	—
-155(A), -150X(A)						
DFD-310(A), -350(A)	3	H	30	30	—	—
-355(A)		V	36	36	—	—
SSFD-110(a), -150(A),	1-1/2	V	30	30	—	—
-155(A), -150X(A)						
SSODFD-110(A), -150(A),	1-1/2	V	30	30	—	—
-155(A), -150X(A)						

Questions?