Damper Application Manuals & Fire/Smoke Damper Manual Updates

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AHR EXPO Atlanta FEB 6-8

Lisa Cherney

Education Manager, AMCA International

Session Moderator

- Joined AMCA in February 2019
- Responsible for development of AMCA's education programs; staff liaison for the Education & Training Committee
- Projects include webinars, online education modules, presentations at trade shows, AMCA Speakers Network and many other items.

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Michael Bulzomi

Product Manager – Commercial Dampers Greenheck

- Over 16 years experience in the HVAC industry
- Has held positions in sales, marketing and application engineering across the U.S. for HVAC product manufacturers and Sales Reps
- Holds an MBA, and a Bachelors in Earth Science and Atmospheric Science
- Active member of ASHRAE, NFPA & AMCA, serving on multiple committees; Current Chair of the AMCA Fire & Smoke Damper Subcommittee

Damper Application Manuals & Fire/Smoke Damper Manual Updates

Purpose and Learning Objectives

The purpose of this presentation is to provide an overview of AMCA Publication 502 & Publication 503 and how to best apply these documents.

At the end of this presentation, you will be able to:

1. Explain which publication is applicable to a specific kind of damper.
2. Identify differences between a Control Damper and a Life Safety Damper.
3. Describe at a high level the various test methods for different types of Dampers.
4. Provide feedback on what information is most valuable to YOU!

Agenda

Which application guide do I use?

What information is inside Publication 502?

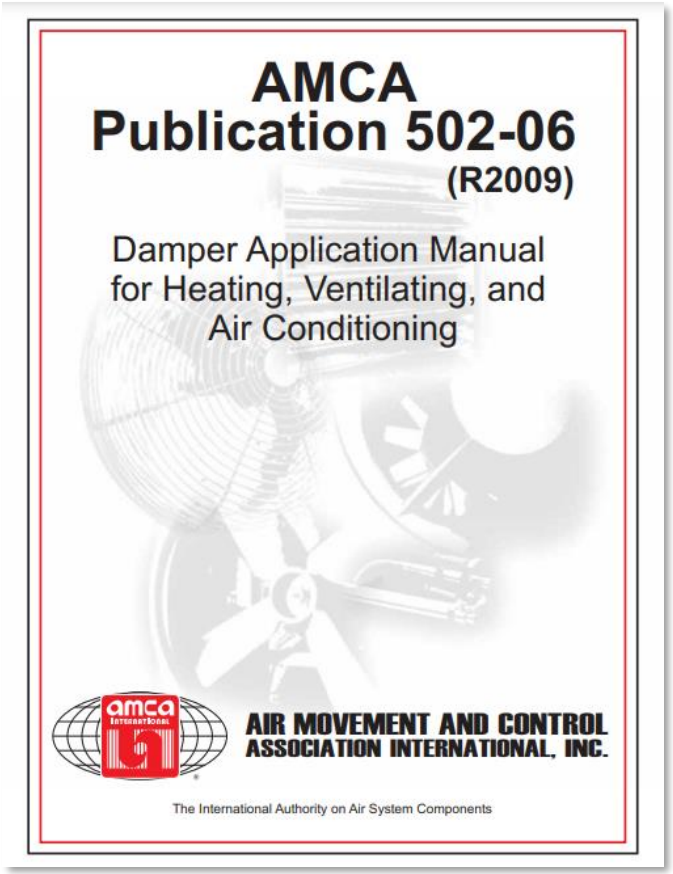
- Commercial Control Dampers Basics
- Commercial Damper Testing & Rating
- Commercial Damper Installation & Maintenance

What information is inside Publication 503?

- Life Safety Dampers Basics
- Life Safety Damper Test Standards
- Life Safety Damper Installation, Testing & Maintenance

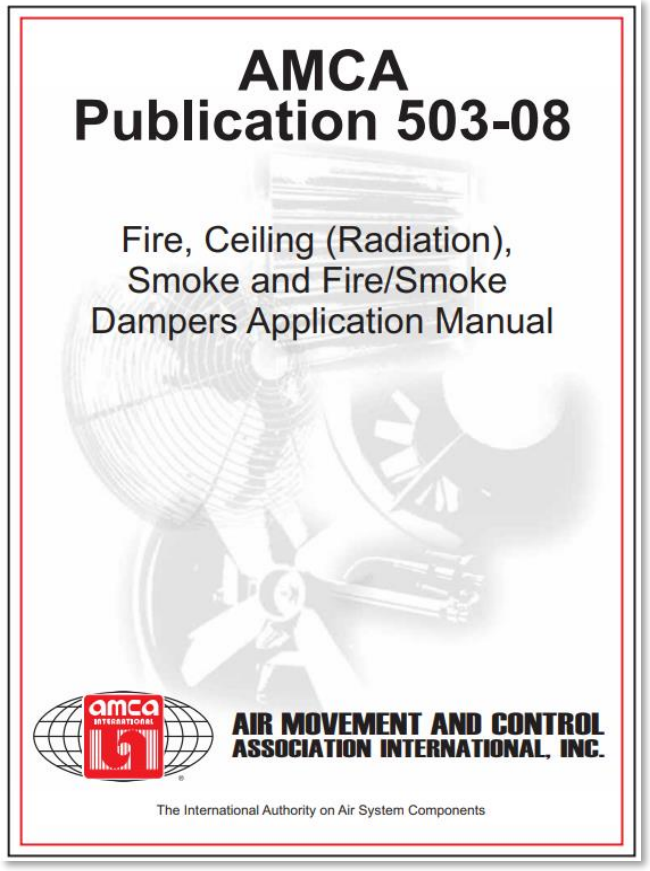
Which Publication?

Which Publication do I use?



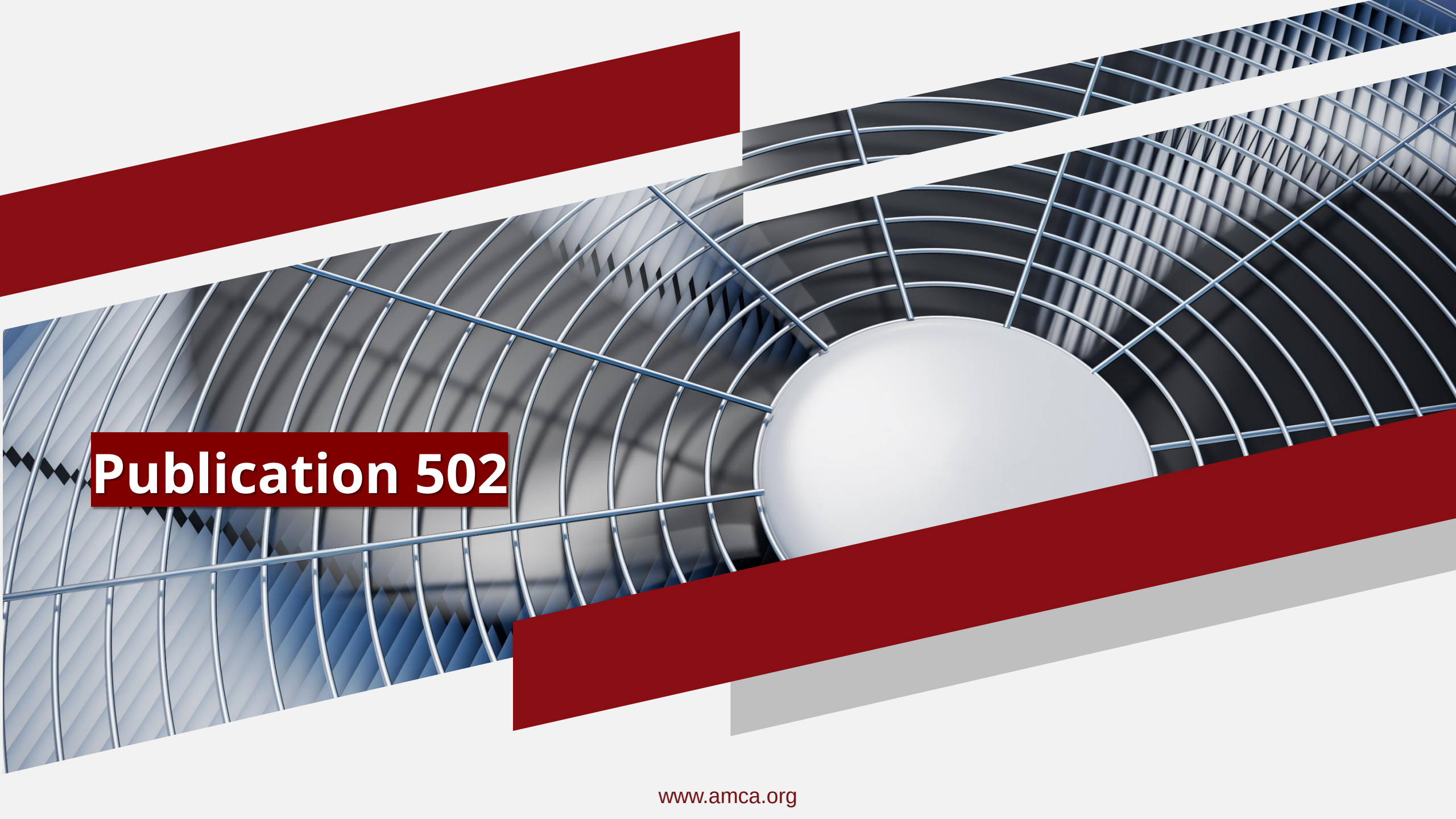
Control Dampers

(Control, Balancing, Backdraft)



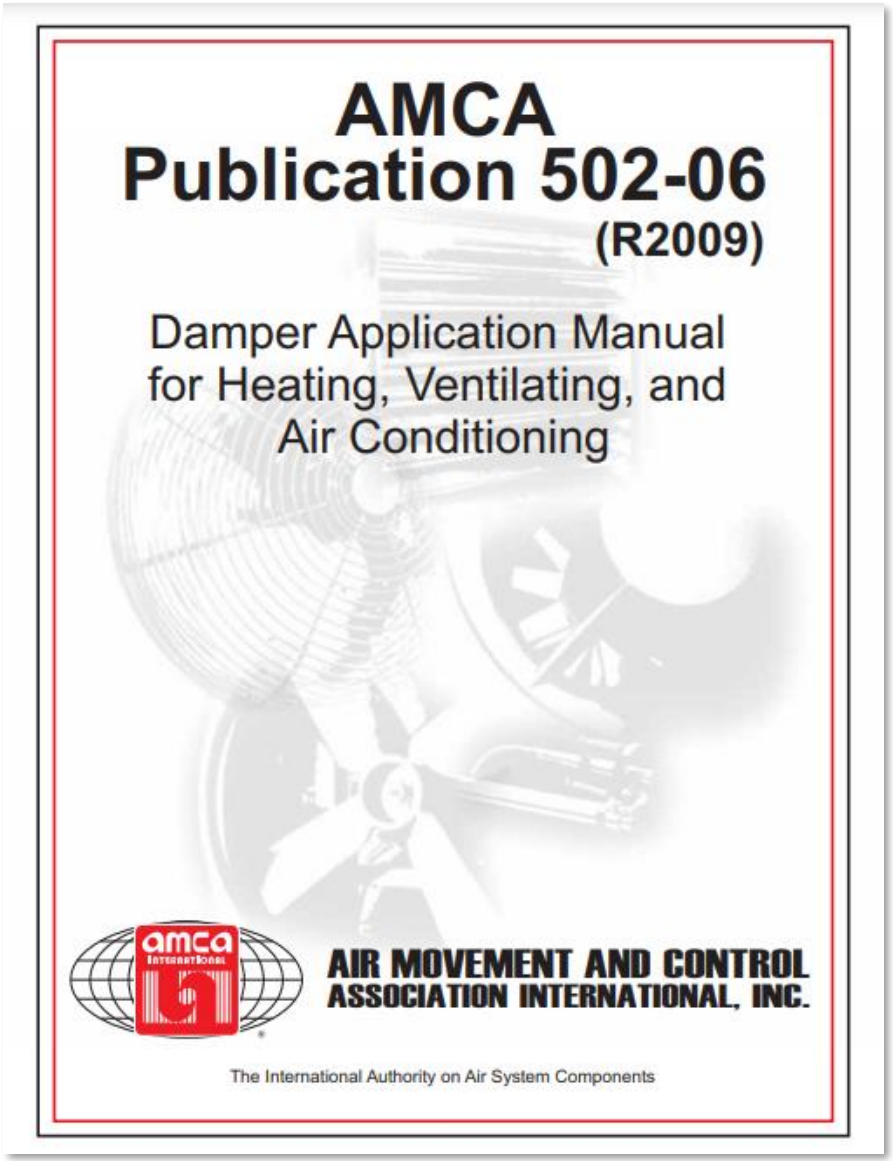
Life Safety Dampers

(Fire, Smoke, Ceiling Radiation)



Publication 502

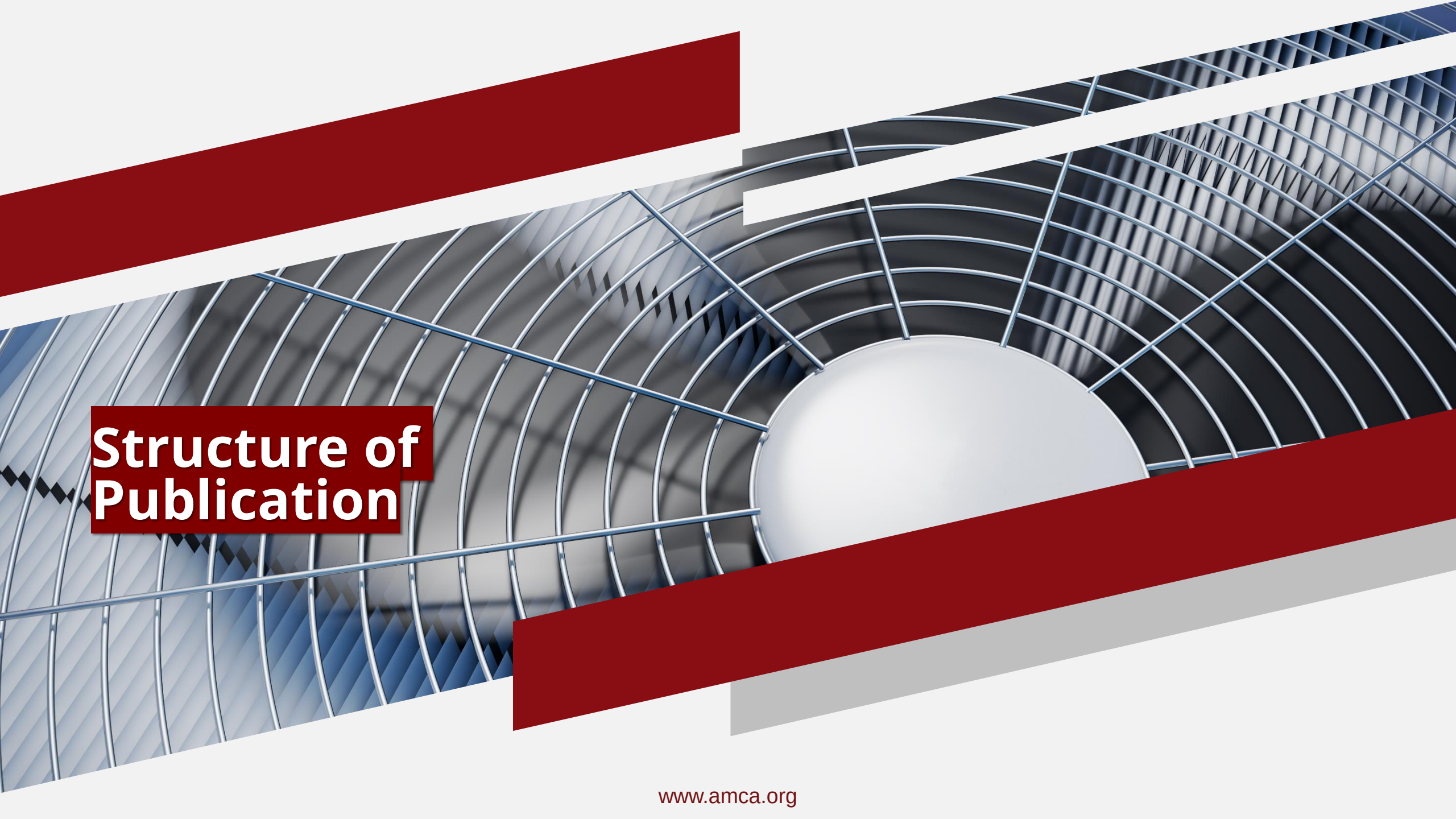
Publication 502: *Damper Application Manual for Heating, Ventilating, and Air Conditioning*



A guide to understanding the various types of dampers available and items to be considered for their proper use.

Scope

- To provide information for designers and specifiers of HVAC systems utilizing commercial volume control dampers.
    - * In general, for use in systems with temperatures from -28 °C to 121 °C (-20 °F to +250 °F), pressures to 2500 Pa (10 in. wg) and velocities to 25.4 m/s (5000 fpm).
- For dampers classified as fire dampers, radiation dampers and smoke dampers, see AMCA Publication 503.



Structure of Publication

Table of Contents

- Damper Applications
- Damper Designs
- Performance Testing
- System Effects
- Damper Selection
- Types of Construction
- Accessories
- Finishes
- Installation Methods
- Glossary

Damper Applications

- Dampers can be used in HVAC systems to control:
  - **Volume**
  - **Temperature**
  - **Pressure**

- These dampers are commonly single blade, parallel blade, or opposed blade type.

- Manual, pneumatic and electric actuators, or other devices, are available to control the dampers.

Damper Design

- Frame Construction
  - Hat Channel, U-Channel, Flat Frame, Flanged
- Jamb Seals
  - Stainless Steel, Silicone
- Blade Types
  - Triple Vee, Airfoil, Flat Blade
- Blade Seals
- Blade Stops
- Axles, Bearings, Linkages
- Mullions/Multi-section configuration

Blade Styles

3V Blade

Fabricated Airfoil

Extruded Airfoil

Round

Performance Testing

ANSI/AMCA Standard 500-D, Laboratory Methods of Testing Dampers for Rating

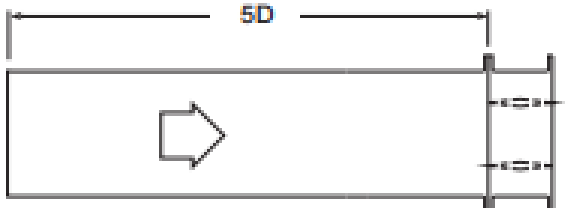
- Establishes uniform laboratory test methods for dampers including air leakage, pressure drop, dynamic closure, operational torque, and elevated temperature testing.

AMCA Publication 511, Certified Ratings Program - Product Ratings Manual for Air Control Devices

- Dictates proper presentation of data and other required technical procedures for certification of air control devices under the AMCA Certified Ratings Program.

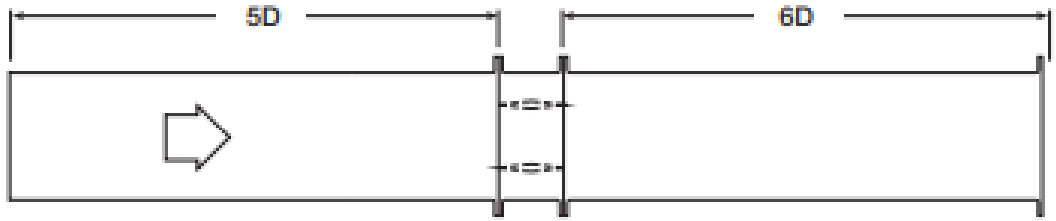
AMCA 500-D Test Figures

AMCA 5.2



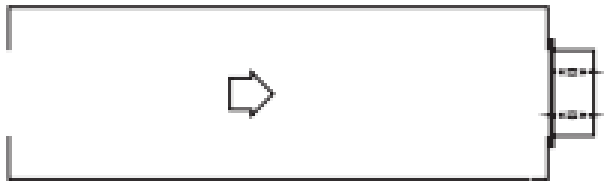
- **Figure 5.2**
  Measure of the pressure drop across the damper plus the exit losses due to the air velocity being dissipated in a zero velocity plenum with no chance for static regain

AMCA 5.3



- **Figure 5.3**
  Measure of the pressure drop of the damper only, under ideal conditions of fully developed airflow upstream and sufficient duct length for static regain downstream of the damper.

AMCA 5.5



- **Figure 5.5**
  Statement of the pressure differential required to accelerate the air to a given velocity and overcome any entrance (exit) losses due to the blockage and entrance (exit) conditions

AMCA 511 Damper Rating Seals

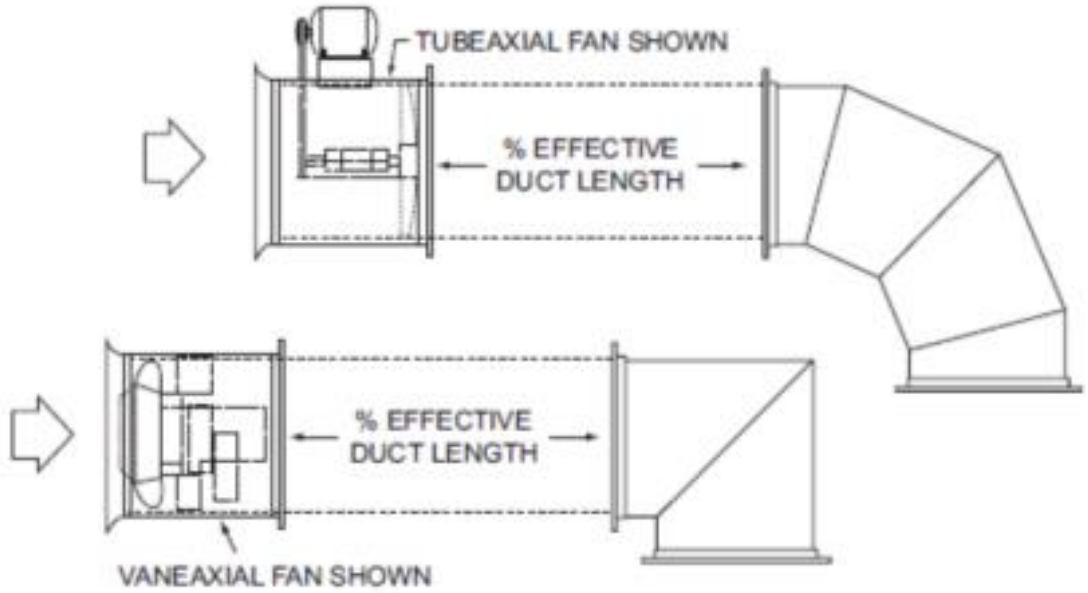
- Air Performance
  - Air Leakage
    - Efficiency

System Effects

- Conditions that cannot be measured directly, but such effects do influence the final performance of the damper.
- Additional losses can occur in air systems because of the physical relationship of various components in the system.
- Dampers are tested for performance in a variety of installation geometries (i.e. AMCA 500-D).

System Effects

Published performance data is tested to specific conditions under controlled procedures. Field or system conditions such as elbows, length of inlet and outlet ducts, or induct obstructions, will affect performance results.



Damper Selection

- Factors to consider:
  - System pressures
  - Leakage rates
  - Temperature ranges
  - Environmental effects
  - Life cycle requirements, cycle time, and maintenance needs
  - System Effects

Damper Selection

Applications:

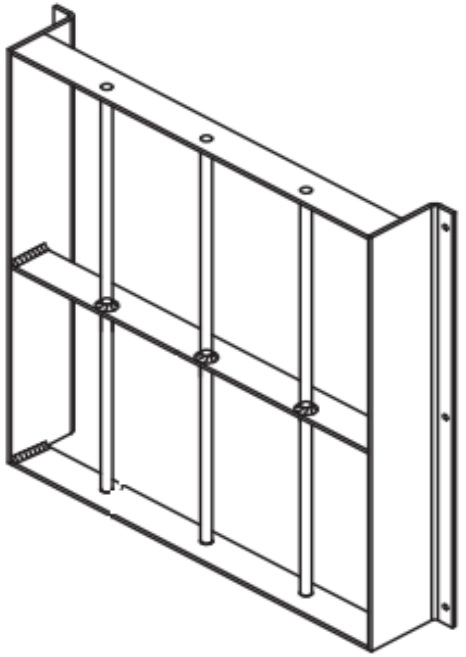
- **Volume Control**
  - Balancing Dampers
  - Modulating Dampers
  - Isolation/Shut-off Dampers
- **Temperature Control**
  - Face & Bypass Dampers
  - Mixing Dampers
- **Pressure Control**
  - Backdraft Dampers
  - Pressure Relief Dampers
- **Fan Inlet/Outlet Dampers**

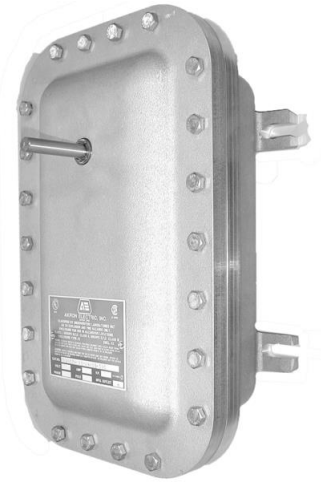
Damper Construction

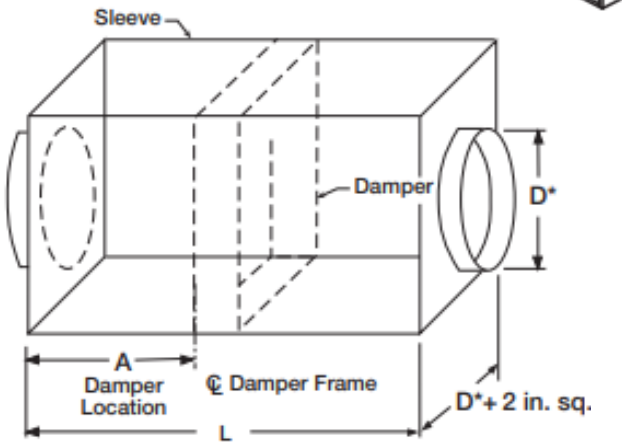
- Typical materials used in damper construction are:
  - Aluminum
  - Cold rolled or galvanized steel
  - Stainless steel
- Blades & Frames can be Formed (fabricated) or Extruded
- Blade Seals are typically rubber, synthetic materials, or flexible metal
- Jamb (side) Seals can be flexible metals, rubber or synthetic materials
- Bearings are commonly Sleeve type (bushings) can be made of stainless steel, brass, sintered bronze, and a variety of synthetic materials
- Blade Axles, Damper Linkages, Jackshafts are commonly made from steel, stainless steel, or aluminum

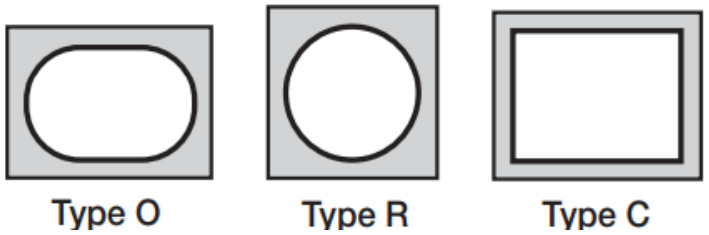
Damper Options & Accessories

Options & accessories are items mounted on the damper or construction features used to enhance its use in the system.







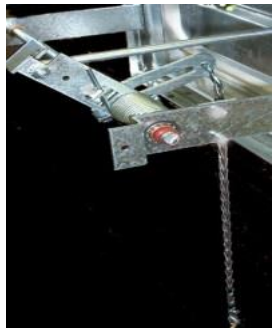


Actuator Types

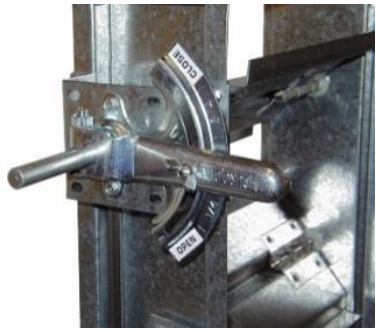
- Electric
  - 120 VAC
  - 24 VAC
  - 24 VDC
  - 230 VAC
- Pneumatic
- Manual
  - Quadrant type
  - Pull chain type

Electric

Pneumatic



Pull Chain



Manual Quadrant

Special Finishes

- **Mill Finish** - unfinished aluminum, mild steel, galvanized steel, electroplated steel or stainless steel.
- **Baked Enamel** - one-coat system designed to color and add durability to products.
- **Powder Coat** - electrostatically charged and sprayed onto the part, then baked in an oven.
- **Epoxy** - two-part finish that results in a hard durable surface resistant to frequent contact with liquids or exposure to chemical vapor or fumes.
- **Fluorocarbon** - premium color finishes that impart properties not attainable with other organic coatings
- **Anodizing** - electronic oxidation process which is used on aluminum sheet or extrusion.

Installation Methods

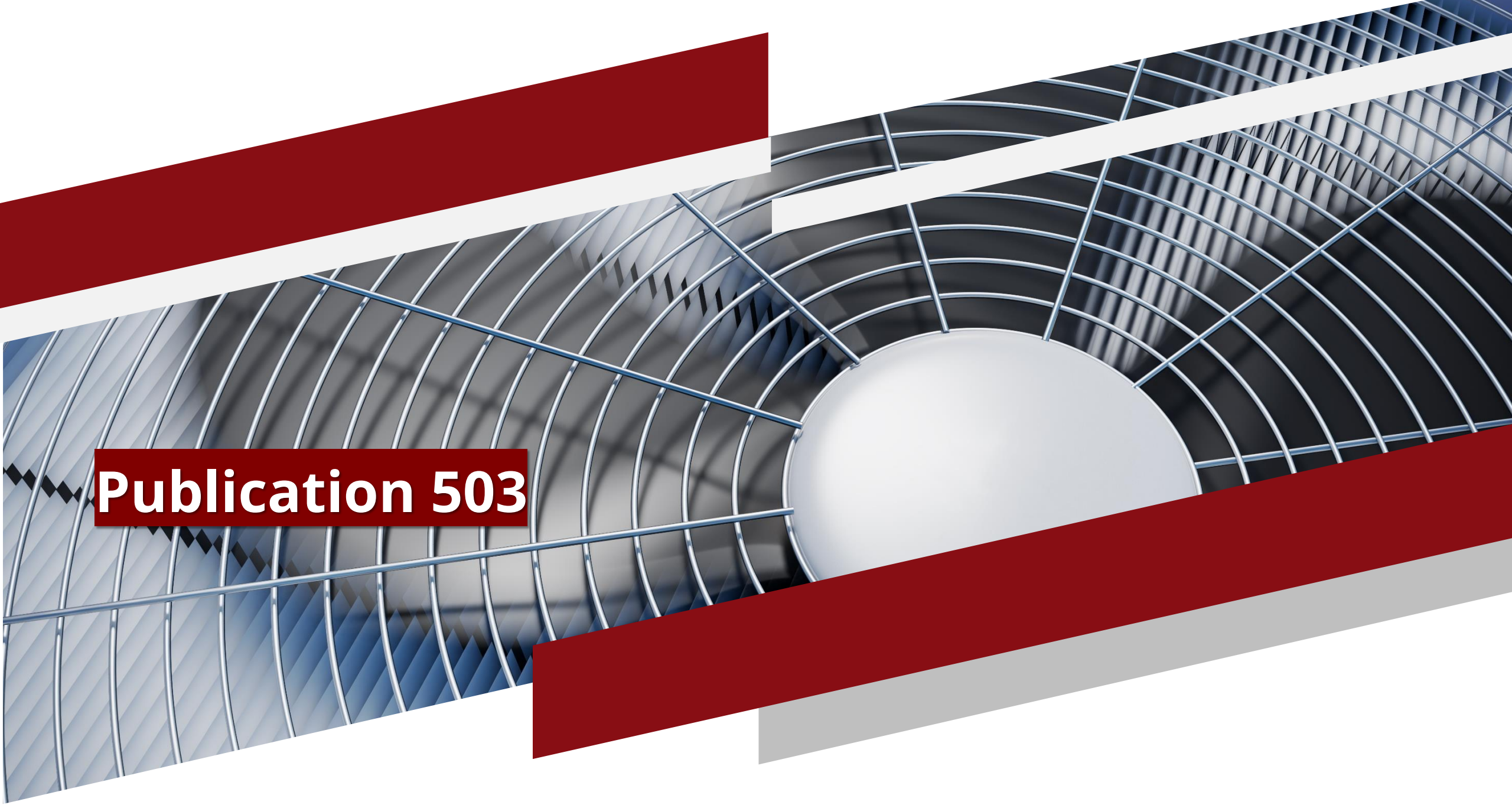
- Dampers must be installed properly in order for them to perform and operate as intended.
- Dampers should be inspected before installation for shipping damage and to make sure that they will operate properly.
- ***Prior to starting any installation, the manufacturer's installation instructions should be carefully reviewed.***

- Single section vs. multiple section installations
- Masonry, metal frame or in-duct, wood frame, and fiberglass installations covered

Next Draft of Publication 502:

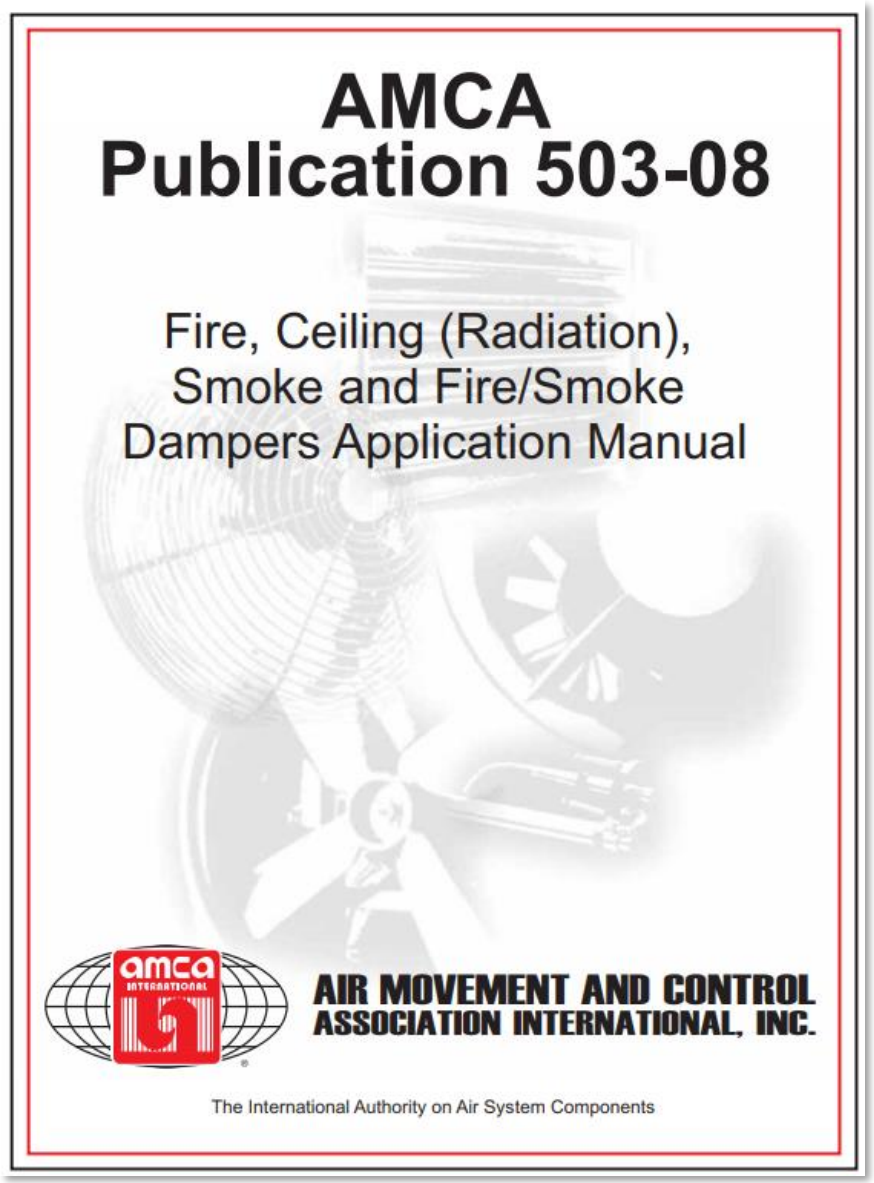
What do YOU want to see?

- What kind of general HVAC applications/installations do you most encounter that you'd like to see covered?
- What information would you find most beneficial?



Publication 503

Publication 503: *Fire, Ceiling (Radiation), Smoke and Fire/Smoke Dampers Application Manual*



A guide to understanding the various types and special nature of fire, ceiling (radiation), smoke, and fire/smoke damper products so that they may be properly selected, applied, installed, inspected, and maintained.

Scope

- This publication covers damper products tested and rated per the requirements of AMCA International, Underwriters Laboratories (UL), and other independent testing laboratories.

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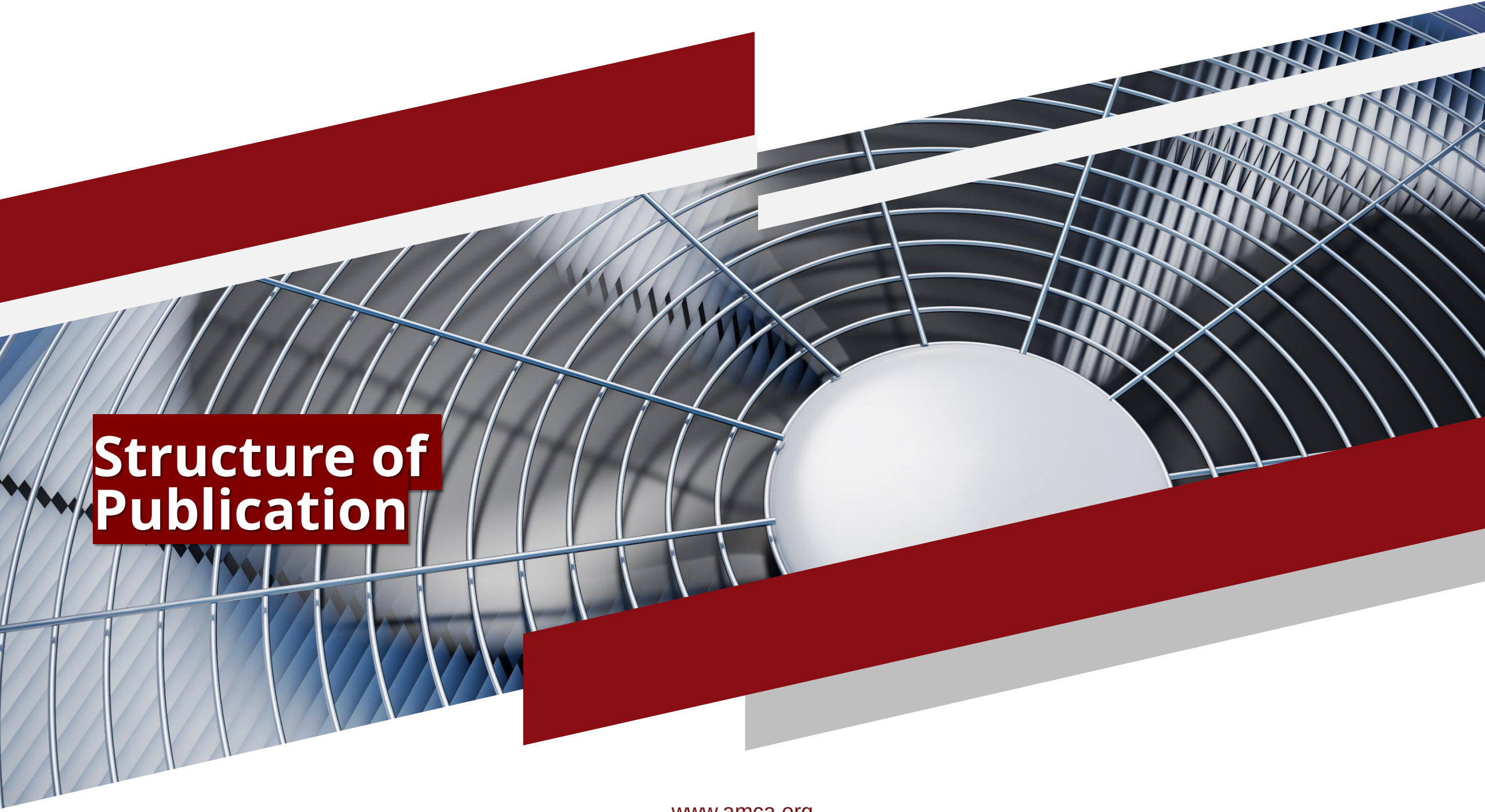
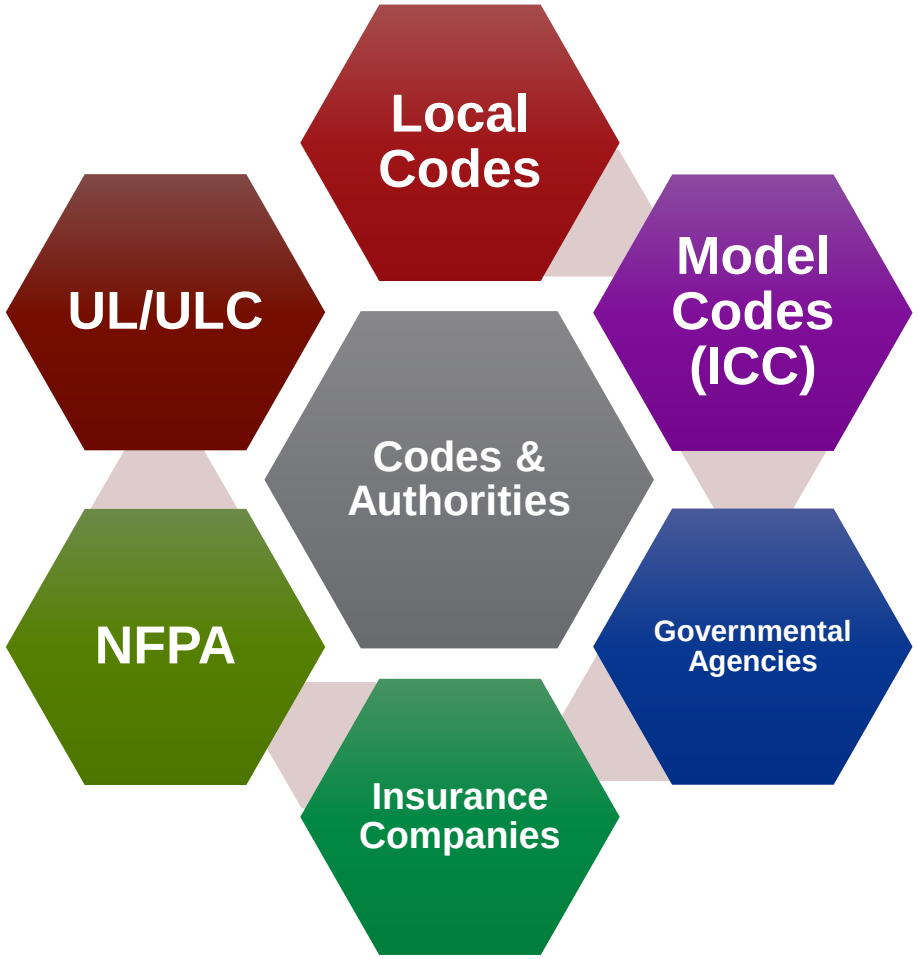


Structure of Publication

Table of Contents

- Definitions
- Codes and Authorities
- Testing and Rating
- Labeling
- Damper Selection
- Installation Methods
- On-site Testing, Maintenance, and Inspection
- Accessories
- FAQs

Codes and Authorities



Testing and Rating

Fire Dampers:

- Hourly ratings (1-1/2 or 3 hours)
- Mounting orientation (horizontal or vertical)
- System conditions (static or dynamic)
- Airflow and pressure (dynamic only)

Smoke Dampers:

- Leakage ratings (Class I or Class II)
- Airflow and pressure (fpm & in. w.g.)
- Fail position (open or closed)

Fire/Smoke Dampers:

- Hourly ratings (1-1/2 or 3 hours)
- Mounting orientation (horizontal or vertical)
- Leakage ratings (Class I or Class II)
- Airflow and pressure (fpm & in. w.g.)
- Fail position (open or closed)

Ceiling Radiation Dampers:

- Hourly ratings (1 hour or 3 hours)
- System conditions (static or dynamic)
- Airflow and pressure (dynamic only)

Testing and Rating

Table 5.1 - UL Testing Requirements Summary

Type of Test	Static Fire Dampers* UL 555	Dynamic Fire Dampers** UL 555	Comb. Fire/Smoke Dampers UL 555 UL 555S	Corridor Dampers UL 555 UL 555S	Smoke Dampers UL 555S	Ceiling Radiation Dampers UL 555C
Fire Endurance	X	X	X	X	--	X
Hose Stream	X	X	X	X	--	--
Cycling	X	X	X	X	X	X
Salt Spray Exposure	X	X	X	X	X	X
Spring Closing Force	***	X	X	X	X	X
Dynamic Closure	--	X	X	X	--	X
Operation	--	--	X	X	X	X
Leakage	--	--	X	X	X	--
Dust Loading	--	--	--	--	--	X

* Static Fire Damper is designed to operate in HVAC systems that automatically shut down in the event of a fire.

** Dynamic Fire Damper is designed to operate under specific airflow conditions in HVAC systems that do not shut down in the event of a fire.

*** This test is only applicable if springs are used to close the damper.

Labeling

Table 6.1 - Damper Labeling Information

Damper Requirements	Fire Dampers	Ceiling (Radiation) Dampers	Smoke Dampers	Fire/Smoke Dampers†
Manufacturer identification	X	X	X	X
Type of damper	X	X	X	X
The leakage rating of the damper			X	X
The hourly rating of the damper	X			X
Proper mounting (orientation) for installation	X	X	X	X
Reference to the manufacturer's installation and/or operating instructions	X	X	X	X
The damper model or designation	X	X	X	X
The date/code the damper was manufactured	X	X	X	X
Indication as to whether the damper has been rated for use as a Volume Control Damper			X	X
The temperature rating of the smoke damper			X	X
The maximum rated airflow and pressure difference rating	X*		X	X
The electrical rating for the electrical actuator	X		X	X
The maximum and minimum pressure ratings for the pneumatic or hydraulic actuator	X		X	X
Indication as to whether the damper has been rated for static or dynamic systems. If the damper is rated for dynamic systems, the damper label should indicate the air flow and the closure pressure rating	X	X		
Reference that the ceiling damper has a rating that may be referenced by reviewing the applicable ceiling assembly designs or by hourly-rated listings		X		
Label Located on an internal surface	X	X	X	X

*Not required for static fire dampers

† Includes corridor dampers

Damper Selection

Factors involved in selecting a damper include:

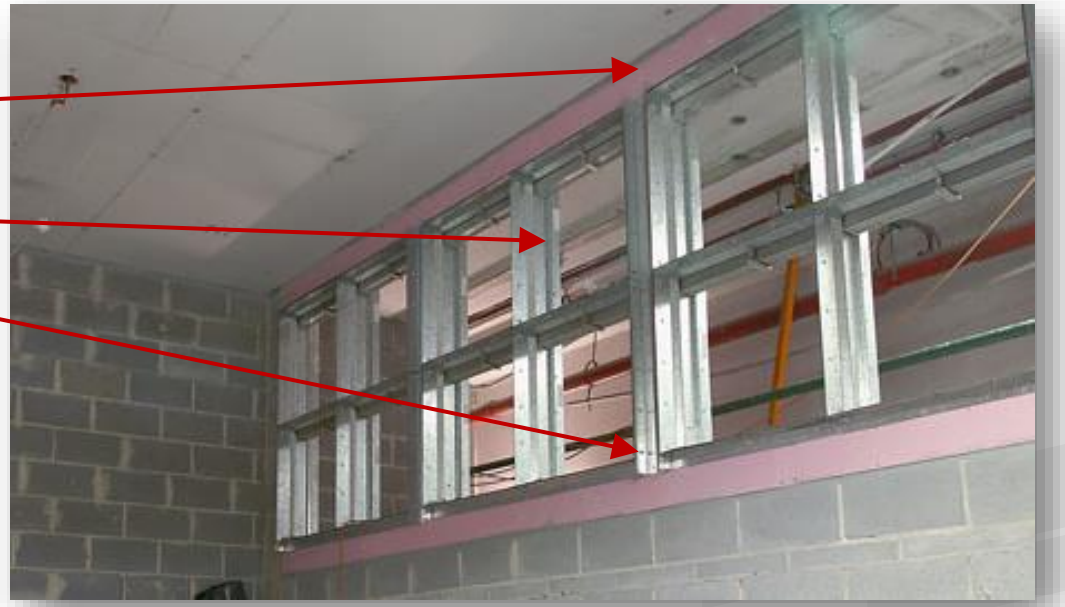
- **Type of barrier being penetrated**
  - Hourly rating
  - Mounting orientation
  - Space envelope
- **System requirements**
  - Pressure drop
  - Velocity rating
  - Pressure rating
- **Design or Code requirements**
  - Leakage rating
  - Temperature Rating
  - Control Function
  - Actuating device

Installation Methods

The installation of fire dampers, smoke dampers, combination fire/smoke dampers, corridor dampers, and ceiling (radiation) dampers should conform to the manufacturer's approved installation instructions.

The local authority having jurisdiction (AHJ) ultimately approves installations and may permit variations.

1. **Rated Barrier**
2. **Listed Product**
3. **Installation Requirements**



On-site Testing, Maintenance, Inspection

Dampers should be inspected to:

- Ensure they have been installed square and free from racking
- Verify correct voltage and electrical connections where applicable
- Guarantee proper operation by cycle testing to assure that they perform their intended function

Accessories

- **Sleeves**
  - Fire and Combination Fire/Smoke Dampers
    - Most installations require the damper to be installed in a sleeve. Sleeves are not required if the damper frame is long enough to allow direct attachment of the required perimeter mounting angles.
  - Smoke Dampers
    - Not required by code or product listing
- **Retaining Angles**
  - Fire and Combination Fire/Smoke Dampers
    - Required by product listing. Used to secure the damper/sleeve assembly into the wall/floor opening.
  - Smoke Dampers
    - Not required by code or product listing
- **Access Doors**
  - Required by code for testing & maintenance
- **Position Indicating Devices**
  - Optional, may be required by local code or authority having jurisdiction (AHJ)

Smoke & Fire/Smoke Actuators

- Actuators must be **factory installed,** per UL.
- Electric (120V, 24V, 230V) or Pneumatic.
- Two position (open/closed) and Modulating (Balancing) types.
- Different torque ratings, selection based on tested size of assembly.
- May be externally or internally mounted.

Next Draft of Publication 503:

What do YOU want to see?

- What kind of HVAC applications/installations do you most encounter that you'd like to see covered?
- What information would you find most beneficial?

Summary

- Publication 502: General HVAC dampers
- Publication 503: Life Safety Dampers
- Both publications include a wealth of knowledge, created for HVAC industry professionals new & experienced
- **Both publications are up due for revision and YOUR input and participation are greatly appreciated!**

Q & A

Survey QR Code:

Thank you for your time!

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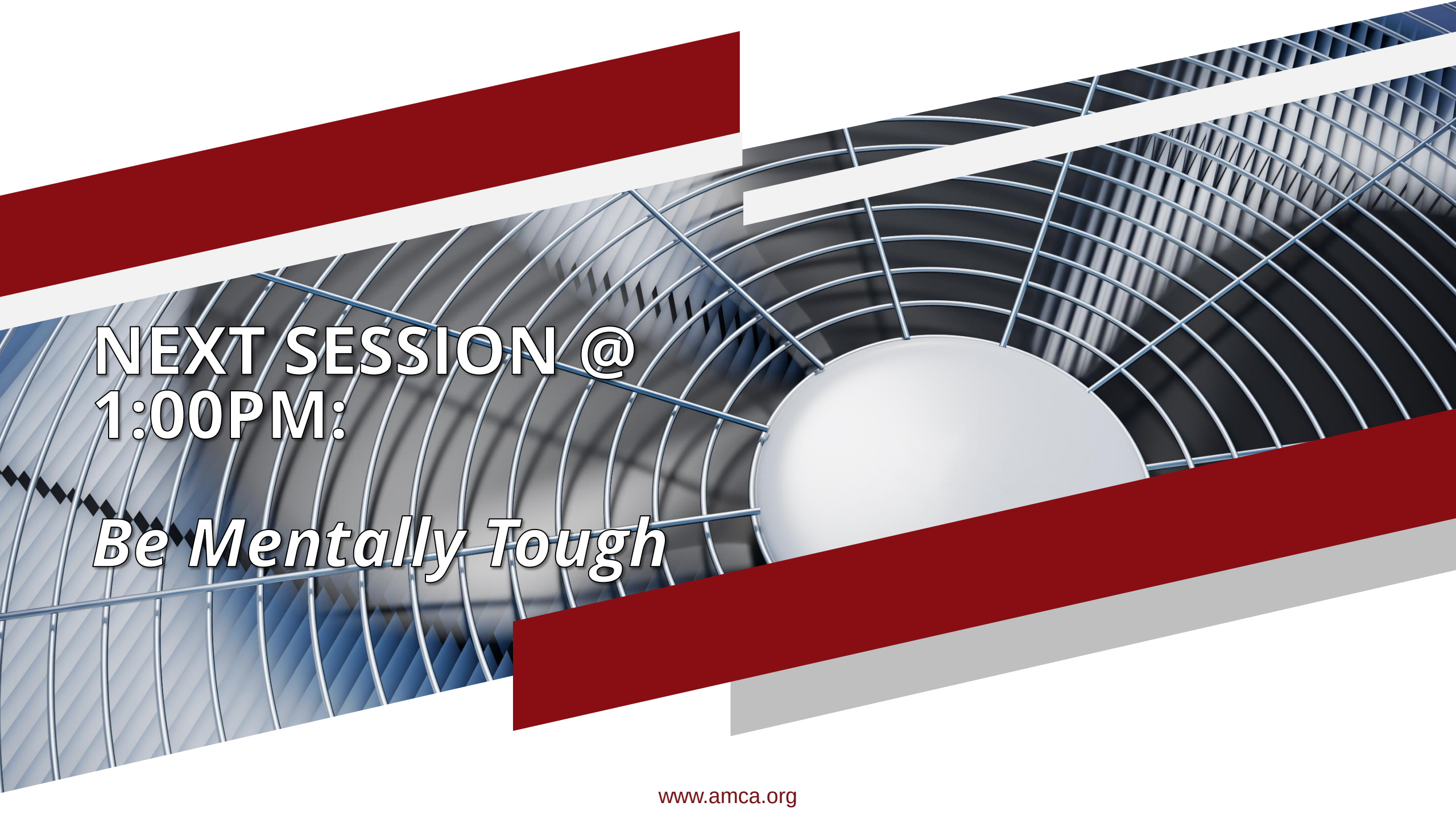
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1:00PM:
Be Mentally Tough