A Supplement to HPAC Engineering Magazine

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AMCA INTERNATIONAL inmotion

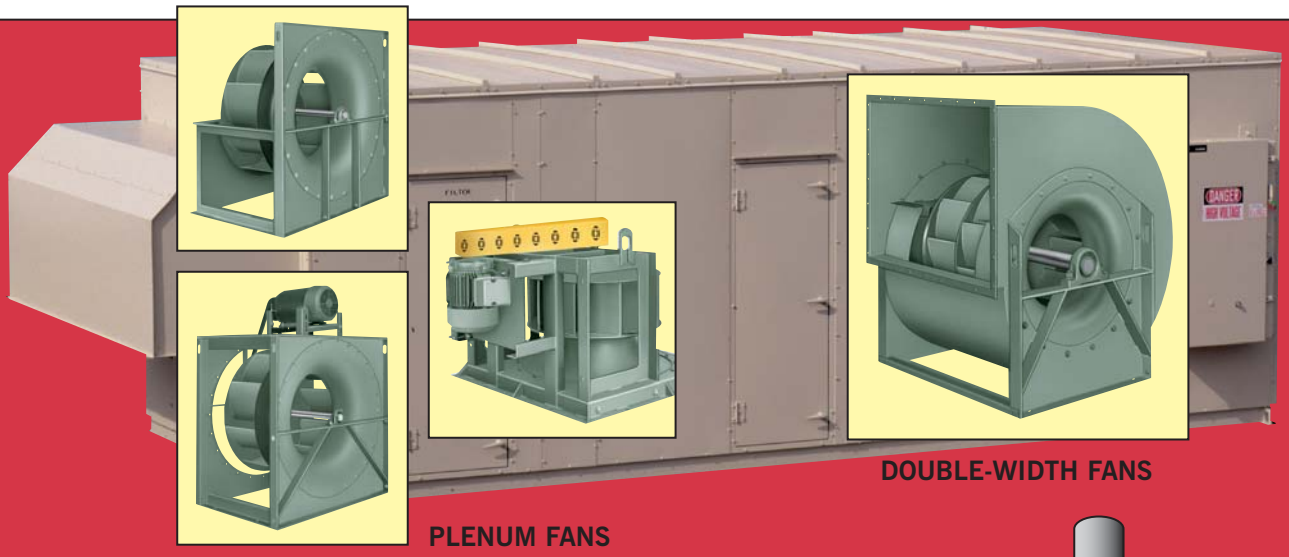
THE ONLY MAGAZINE DEDICATED TO THE AIR MOVEMENT & CONTROL INDUSTRY

In This Issue:

Life Safety Dampers

Effective Smoke Control

In-line Fans



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INMOTION

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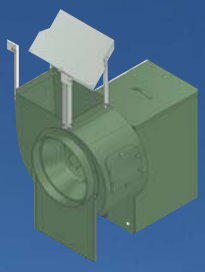
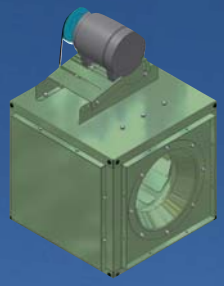


Upblast Exhauster



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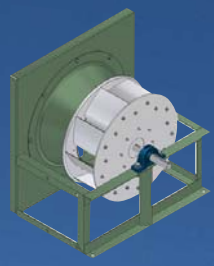
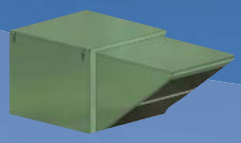
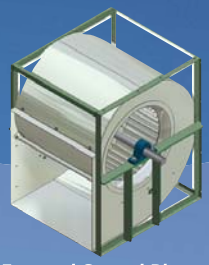


Plenum Fan

Upblast Exhauster



Side Intake Supply Fan



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PRESIDENT'S MESSAGE

Getting our message out about the important role that fire and smoke dampers play in life safety will continue to be an important endeavor.

As my year as president of AMCA International, Inc. draws to a close, I would like to reflect briefly on my experiences within the industry and abroad.

This past year has been both challenging and rewarding for me personally. I have been fortunate to get to know many of our members in North America as well as in China at the Pacific Rim Regional meeting last April. The association continues to work with our members and industry professionals around the world to keep you abreast of the information, services, and products available in our industry.

In my role as president, I was invited to participate in many industry meetings and events. I am pleased to report that the level of cooperation between associations continues to grow. There is tremendous support for coordinating our efforts to improve our industry as a whole.

A year ago we launched the first issue of AMCA International's *InMotion* magazine. This magazine provides an exclusive members-only marketing opportunity for advertising, educational white papers, and case studies. It is published twice a year and is distributed worldwide to over 56,000 HVAC professionals.

The articles in this issue are relevant to all of us both professionally and personally. The topics covered impact our families and everyday lives. Proper product applications and installations are critical to the efficiency of our HVAC systems and affect our environments. Life/safety is an extremely important issue that is being decided by building code officials, often with cost being the deciding factor. Getting our message out about the important role that fire and smoke dampers play in life safety will continue to be an important endeavor.

In closing, continue to look to *InMotion* for the latest industry trends, products, and services from AMCA International. I want to thank all of you for your contributions now and in the future, and trust that this information will continue to be of value to our readers. More information about AMCA can be found at *www.amca.org* as well.

Sincerely,

Jo Reinhardt
AMCA International President 2006-2007
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AMCA International Annual Meeting

AMCA will host its 52nd Annual Meeting from October 12-15, 2007, in Phoenix, AZ. This is a terrific opportunity to network and learn more about what is happening within AMCA and the industry overall. In addition, the Phoenix area has many interesting and entertaining places to visit for both members and their families. For more information, go to *www.amca.org.*

Gary Benson Elected AMCA International President

Gary Benson, president of Mechanovent Corp., a New York Blower Company, Willowbrook, IL, was recently elected as president of AMCA International.

Benson has served as chairman for numerous AMCA International committees and taskforces over the last 20 years. Elected to the AMCA Board of Directors in 1999, he has served on the AMCA Executive Committee since 2005, and this past year as vice president of AMCA.

Benson plans to focus his efforts toward completion of AMCA's strategic plan with particular emphasis on the following four goals:

- Ensure maximum ROI to members throughout the world, providing quality services and support exemplified by efficient product testing, technical education, certification programs, and effective association meetings
- Timely completion of the renovation project underway at AMCA headquarters in compliance with LEED requirements
- Continue to strengthen the association's fiscal position
- Continue to support green initiatives and sustainable technologies as developed by ASHRAE and other industry and governmental bodies.

Circle 5

AMCA Signs MOU with AFMA

AMCA International and Singapore-based AFMA Technologies PTE Ltd. (AFMA) recently signed a Memorandum of Understanding (MOU) for a collaborative venture where AFMA will act as AMCA's agent administering AMCA's Certified Ratings Program in Singapore.

This agreement was generated by AMCA International's continued efforts to expand the Certified Ratings Program in Southeast Asia, the Middle East, and India. AMCA has entered into similar MOUs with organizations in Korea and China. Goals include advancing the use of identical procedures for product certification throughout the world, simplification, standardization, and cost reduction.

AMCA-authorized agents collect documentation from licensees and guide them through the certification process. AMCA will continue to grant the licenses to use the Certified Ratings Program Seal.

Back by Popular Demand

December 3-5, 2007, AMCA will present, *"An Introduction to the Basics of Acoustics and Acoustical Ratings for the Fan Industry."*

Presented by Joe Pope, Pope Engineering Co., this popular program presents information on acoustics and sound relevant to fan sound specification and sound testing.

Material is covered at an introductory to intermediate level appropriate for individuals with limited formal exposure to the subject. The course is also suitable for experienced personnel seeking a refresher, and is appropriate for those with management, engineering, sales, and/or marketing backgrounds. For more information, contact Joe Brooks at ***jbrooks@amca.org.***

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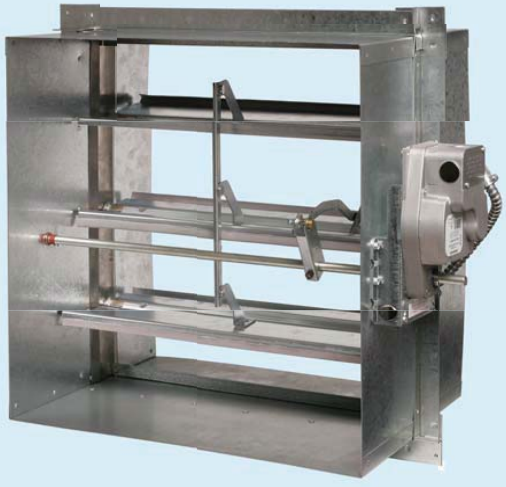
air balance



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* LOWER ANNUAL ENERGY COSTS and life cycle costs. These dampers can provide the building owner with both initial design cost savings via fan hp reductions, and life cycle cost savings via annual energy cost reductions.

* REDUCES LABOR COSTS in field installation time. The factory supplied sleeve is fabricated with one-side perimeter mounting angles, which reduces field labor and provides the contractor with a "slide in" installation.

Circle 6

AMCA'S CERTIFIED RATINGS PROGRAM

A Closer Look

One of AMCA International's most important functions is managing its Certified Ratings Program. The purpose of the Certified Ratings Program (CRP) is to give the buyer, specifier, and end-user of air movement and control equipment assurance that published ratings are reliable and accurate. At the same time, the program assures manufacturers that competitive ratings are based on standard test methods and procedures, and are subject to review by AMCA International as an impartial authority.

AMCA's Certified Ratings Program (CRP) was developed in response to a need for validated, published product performance ratings for buyers, specifiers, and users of air movement and control devices.

The AMCA CRP assures specifiers, contractors, buyers, and building owners that the manufacturer's product lines have been tested and rated in conformance with approved AMCA test standards and rating requirements. Only after the product has been tested and the manufacturers' cataloged ratings have been submitted to and approved by AMCA International's staff, can performance seals be displayed in literature and on equipment. Additionally, each certified / licensed product line is subject to continuing check-tests every three years in AMCA International's laboratory or at one of AMCA International's Independent Accredited laboratories.

Over the past 50-plus years, AMCA International has developed standardized test methods to cover the products within the AMCA scope. The list of products would include axial and centrifugal fans, power roof ventilators, ceiling ventilators, evaporative coolers, air circulation fans, jet tunnel fans, blowers, air curtains, acoustical duct silencers, dampers, energy recovery ventilators, louvers, positive pressure ventilators, propeller fans, agricultural fans, and airflow measurement stations. These standards cover performance relating to airflow measurement accuracy, air delivery, pressure, psychrometrics, efficiency, power, torque, rpm, thrust, sound power levels, velocity uniformity, outlet velocity, wind-driven rain, water penetration, pressure drop, air leakage, dynamic closure, and operations.

Product performance is vital to the operation and continued success of the manufacturer. Requiring the AMCA CRP seal gives specifiers, contractors, and building owners assurance that manufacturers' performance ratings are comparable, and their product lines have been tested and rated in conformance with AMCA test standards and program requirements.

What to Look for When Specifying or Purchasing Product

AMCA Certified: A product line which is AMCA certified/licensed to bear the Certified Ratings Seal means that the product line has met all of the requirements of the Certified Ratings Program. This would include signing an agreement with AMCA that the product line was tested either at an AMCA accredited lab, an AMCA independent laboratory authorized to perform check and challenge tests, or the AMCA International laboratory located in Arlington Heights, IL, USA. This ensures that all ratings were developed using the procedures identified in the AMCA Certified Ratings Program, and the product line will be (or has been) subjected to a check-test at no greater than three-year intervals. Additionally, the product line catalog has been checked by AMCA International staff ensuring that the ratings and information are correct.

AMCA International's Seal is a Registered Trademark® in Most Industrialized Countries.

Tested in accordance with: Suggests that a manufacturer used one of the AMCA standards to perform a test. It does not certify anything about the ratings development or the qualifications of the laboratory. ***This is not a certification!*** AMCA's standards are readily available to the public, and any entity could state they have used an AMCA standard to test their product(s).

Tested at AMCA: Implies that a product was tested at the AMCA International Laboratory in Arlington Heights, IL, USA. ***This is not a certification!*** Tested at AMCA would carry the same limitations as "tested in accordance with" except that it would certainly mean the laboratory results are reliable.

By specifying AMCA International's Certified Ratings Seal, specifiers, designers, contractors, and building owners can be relieved of certain liability problems or legal entanglements frequently encountered in today's litigious climate. You can specify products with confidence by requesting "Performance ratings shall bear the AMCA International Certified Ratings Program Seal." This simple statement can greatly assist a specifier in demonstrating that due diligence was exercised in selecting equipment and that reasonable steps were taken to ensure that performance guarantees would be met.

A directory of certified/licensed products listed by manufacturer name and product type is available at *www.amca.org.*

Ask Hans

What sectors are being hit hardest by the housing slump and what is the Fed going to do about it?

Many different industries are feeling the housing slow down. Obviously the first group to feel the impact is residential homebuilders. According to the U.S. Census Bureau, seasonally adjusted new housing starts were down 27% on average for the first five months of 2007. Building permits – the primary leading indicator of future building activity – were also down by an average of 24% over the same five-month period.

Residential HVAC manufacturers and distributors know well the direct impact the slump is having on their business. The Federal Reserve Bank's HVAC production index is down on average 3.3% for the first five months of 2007. This index looks at both residential and non-residential industrial production. The resulting negative index suggests that large declines in the residential sector are more than offsetting growth in the commercial and industrial sectors.

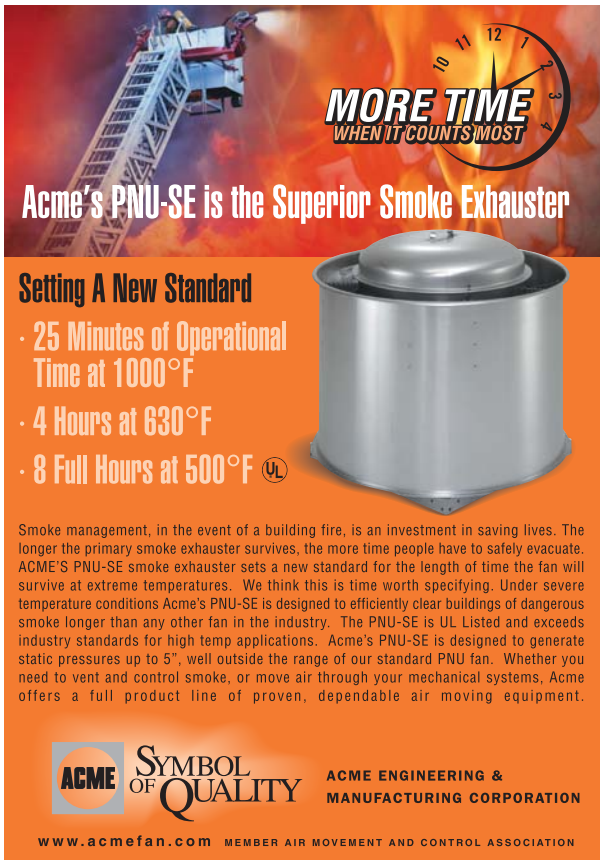
Other related businesses such as home improvement retailers are feeling the pinch. The Home Depot recently revised its earnings estimate downward by 15%, crediting the failure to meet expectations to the sour state of the housing markets. Mortgage lenders, durable goods manufacturers, the lumber industry, and construction labor all feel the pressure of the housing market's lackluster performance.

The trouble with a slump in a large sector of the economy such as housing is that there are many secondary effects. The secondary effects don't show up immediately. They rear their ugly heads 12 to 18 or even 24 months down the road.

The most relevant of these secondary effects to the HVAC industry is the impact they can have on demand for products used in the construction of retail buildings. Retail developments tend to follow residential development. Generally a slowdown or speed-up in residential construction comes about 18 months before a corresponding change in retail construction. That could mean a tougher 2008 for that niche of the HVAC world.

How might the Fed take monetary policy action to curb the negative spillover throughout the larger economy? Probably by taking no action at all. The Fed is in a policy conundrum, or as I call it, a pickle. Inflationary pressures from high energy costs compel the Fed to raise the federal funds interest rate. On the other hand, an increase in the federal funds interest rate could produce higher lending rates by mortgage brokers, further damaging an already swooning housing market. The Fed will probably wait and let the markets and price mechanisms work out the problems by themselves. It may produce a little short-run pain for all of us, but in the long run it will probably be less painful than an unnecessary change in monetary policy.

Hans Zigmund is a Chicago-based economist who frequently works with AMCA International. Have a question? Mark it "Ask Hans" and send to mvambreck@amca.org.



Circle 7

DAMPERS

Fire and Smoke Damper Trade-Offs

By Vickie J. Lovell

AUTOMATIC FIRE SPRINKLERS SHOULD BE SUPPORTED BY APPROPRIATE REDUNDANT SAFETY FEATURES SUCH AS FIRE AND SMOKE DAMPERS TO ENSURE THE SAFETY OF THE OCCUPANTS AND THEIR PROPERTY.

There is concern among members of the fire service, design professionals, and code officials who believe we have gone too far with the trade-off concept in order to economically justify the use of automatic fire sprinklers.

Although sprinklers have proven to be an effective fire protection tool, the performance reliability of sprinkler systems during actual fires is passionately debated in the fire protection engineering field and is far from being resolved. Therefore, how much reliance and confidence should be placed in automatic sprinkler systems is argued with startling disparate opinions.

Background: The Evolution of Trade-Offs

The landmark report *America Burning,* released in 1974 by the National Institute of Standards and Technology (NIST), resulted in many positive changes, including greater attention on the nation's fire problem, the needs of the fire service and allied professions, and the creation of the U.S. Fire Administration and the National Fire Academy.

One of the many recommendations in the report was that fire safety would significantly improve through the increased and widespread use of automatic sprinkler systems. The report suggested that "automatic sprinklers can pay for themselves in damages prevented, and the model codes should permit other savings by relaxing requirements for other fire safety features when automatic sprinklers are installed."

That report endorsed reducing or eliminating (a concept commonly referred to as trading off or trade-offs) some of the built-in fire and smoke protection that would help offset the building owner's cost of installing and maintaining sprinklers. The report did ***not,*** however, provide any recommendation or guidance on how much or how little built-in fire protection should be permitted to be traded off.

Since the report was released in 1974 and revisited in 1988, code officials, fire officials, architects, building owners, developers, and system designers have developed their own opinions as to how much built-in fire resistance should be designed into sprinklered buildings, and what the cost/benefit is for appropriate redundant features to compensate for unsatisfactory sprinkler performance.

Over the last 30 years, sprinkler advocates, building developers, and facility owners and operators have increasingly installed sprinklers to improve the fire safety of their buildings but, at the same time, have taken full advantage of the trade-off concept. In many new buildings, this creates a near total dependency on the quality of the design, installation, and maintenance of the sprinkler system to control fire and smoke for the entire life of the building.

Life Safety Dampers Are a Target

During the time period from 1997 until 2007, the number of code sections in the International Building Code (IBC) permitting trade-offs of built-in passive fire and smoke features has nearly doubled, with new trade-offs being proposed and debated every year. In the International Code Council (ICC) building code development process, life safety dampers – such as smoke, fire, or combination fire/smoke dampers – have been targeted for elimination or significant reductions in sprinklered buildings based solely on their cost of installation and maintenance.

However, the proponents of such proposals and those who support the current trend toward a near total reliance on sprinkler systems using such damper trade-offs have not satisfactorily demonstrated that buildings with reduced or no fire and smoke dampers will provide adequate fire protection – and particularly, smoke protection – to the occupants and their property if the sprinkler system fails to control the fire.

– At What Cost?

The code and fire officials who voted on such proposals (FS 136/06-07 and FS 137/06-07) at the 2006-2007 ICC hearings again voted to maintain the current code language, which requires fire and smoke dampers in the building code, recognizing their valuable contribution.

Further Eliminations at What Cost?

As the *America Burning* report pointed out, the frequency and severity of fires in America in the past (and likely the future) are the result of our nation's failure to adequately apply and fund known loss-reduction strategies, which include a redundant approach of layers of fire and smoke protection features. The consequences of the current trend in construction toward a near total reliance on sprinklers based solely on economic incentives may not be in the public's best interest.

An analogy can be made to the automotive industry where redundant safety features are mandatory. Car manufacturers are not permitted to increase their profits on their cars by eliminating airbags at the customer's request if anti-lock brakes and seat belts are installed. If the government were to permit this kind of reduction in automotive safety purely for cost savings, the current highway safety statistics for deaths and injuries would likely increase.

The buildings constructed today will be the primary building inventory 20 to 30 years from now. The resources of the fire services are dwindling, and sprinkler reliability is adversely affected by human error in the design and maintenance of sprinklers, natural disasters, and intentional sabotage. It is imperative that sprinklers are supported by appropriate redundant safety features such as fire and smoke dampers to ensure the safety of the occupants and their property.

Vickie J. Lovell, building code consultant, is president of InterCode Inc., Delray Beach, FL. She can be reached at 561/278-0922 or vjlovell@intercodeinc.com.

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Circle 8

Life Safety Dampers: An Integral Part of

By Mark A. Belke

EVEN WHEN LIFE SAFETY DAMPERS ARE NOT REQUIRED PER THE IBC DUE TO THE INCLUSION OF SPRINKLERS, IT'S ADVISABLE TO ADD THEM FOR CRITICAL FIRE AND SMOKE CONTROL AND ENHANCED OVERALL PROTECTION.

The International Building Code (IBC) was created in 2000 to simplify construction requirements under one common building code for the U.S. Prior to this, three regional codes existed: the Uniform Building Code (UBC), the Standard Building Code (SBCCI), and the National Building Code (BOCA). These three "legacy" codes were based upon many years of knowledge gained from successful and unsuccessful construction methods, life safety improvements, and natural disasters. In addition, the impact of deadly fires, building collapses, hurricanes, and earthquakes all contributed to the extensive body of knowledge that is now contained within the IBC.

Today, IBC council hearings are attended by fire protection engineers, code officials, fire fighters, industry representatives, and government organizations. Proposed amendments and code corrections are discussed, debated, and then acted upon with a goal of striking a balance between occupant safety and the cost of construction.

Maintaining Effective Compartmentation

IBC requirements help ensure life safety during a fire primarily through the concept of compartmentation in which a building is segmented into different "compartments" using fire-rated construction to minimize risk.

For many years, life safety dampers have proven to be a highly effective method for achieving compartmentation. However, in recent years, the IBC has expanded the size of compartments where sprinklers are present and reduced the hourly ratings of barriers where sprinklers are present, which ultimately reduces the number of openings required to be protected by dampers. Expanded compartments reduce the amount of concrete, fire stop, and additional passive methods of preventing fire and smoke spread.

Although sprinklers provide a very important and effective method of controlling fire and flame spread, they do not contain smoke, which can continue to spread after the fire is extinguished. Direct exposure to lingering smoke can severely injure or kill occupants and fire fighters. Although IBC requirements have changed, it's still wise to continue to protect openings and ultimately provide effective compartmentation. Many life safety experts say the current code is too dependent on sprinklers and are concerned about sprinkler system failure. Although some of the latest data indicate sprinklers are effective 88% of the time, a terrible disaster could occur when the sprinkler system does not effectively contain the fire.

Selecting the Right Damper

Just like building codes, the relatively new damper industry has responded to changing life safety needs. In fewer than 40 years, life safety dampers have become much more effective, reliable, and easier to install. New minimum testing requirements allow engineers to properly apply products from all manufacturers and for any sized opening with less

Continued on page 14

Effective Compartmentation…and the IBC

A SUMMARY OF IBC REQUIREMENTS FOR LIFE SAFETY DAMPERS

The following damper requirements are based on Chapter 7 of the *2006 IBC Fire Resistance Rated Construction.*[1] You can see from this information how the use of sprinklers and expanded compartmentation areas has reduced the number of dampers required. These definitions can help you achieve proper building construction and compartmentation per IBC requirements and guide you in life safety damper applications. However, even when dampers are not required per the IBC due to the inclusion of sprinklers, it's advisable to add them for critical smoke control.

Fire Dampers are required to protect duct penetrations and air-transfer openings in the following building elements:

- *Fire Walls* (no exceptions)
- *Fire Barriers* – with the following exceptions:
  - Penetrations tested in accordance with ASTM E 119 as part of a fire-resistance rated assembly
  - Ducts used as part of an approved smoke control system in accordance with Section 909
  - Penetrations by ducted HVAC systems in fire barriers with a fire-resistance rating of one hour or less in sprinklered buildings.
- *Fire Partitions* – with the following exceptions:
  - Penetrations of rated corridor walls and tenant separations in a sprinklered building
  - Duct penetrations where the duct area is less than 100 in^2.

Smoke Dampers are required to protect duct penetrations and air-transfer openings in the following building elements:

- Fire-rated corridor enclosures in sprinklered buildings that are also required to have draft and smoke control doors in accordance with 715.3.3 with the following two exceptions:
  - There is no opening in the duct serving the corridor
  - Ducts used as part of an approved smoke control system in accordance with Section 909 and where the dampers are not necessary for the smoke control system to operate properly.
- *Smoke Barriers* – with the following exception:
  - Where all duct openings occur within a single smoke compartment.

Combination Fire Smoke Dampers are required to protect duct penetrations and air-transfer openings in the following building elements:

- ***Shaft Enclosures*** – with the following exceptions:
  - Fire dampers are not required when a duct penetrates a shaft and extends at least 22 in. upward and exhausts directly to the outside (Figure 716.5.3.1 of the IBC commentary shows this exception)
  - Fire dampers are not required to protect penetrations tested in accordance with ASTM E 119 as part of a fire-resistance rated assembly
  - Fire dampers are not required to protect ducts used as part of an approved smoke control system in accordance with Section 909 and where the dampers are not necessary for the smoke control system to operate properly
  - Fire dampers are not required to protect penetrations in parking garage shafts that are separated from other building shafts by at least two-hour fire-resistant construction (Figure 716.5.3.1 of the IBC commentary shows this exception)
  - Smoke dampers are not required in sprinklered B occupancies to protect an opening for a bathroom exhaust duct that extends at least 22 in. up and directly outside
  - Smoke dampers are not required in sprinklered B occupancies to protect duct openings that are part of an approved 909 smoke control system where the damper could interfere with the smoke control system's operation
  - Smoke dampers are not required to protect penetrations in parking garage shafts that are separated from other building shafts by at least two-hour fire-resistant construction (Figure 716.5.3.1 of the IBC commentary shows this exception).

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Life Safety Dampers, *continued from page 12*

research. In addition, there have been several installation improvements to help the contractor, including single-sided retaining angles, out-of-barrier fire dampers, fire stop installations without retaining angles, and adjoining breakaway connections.

Revisions in UL requirements have also prompted the development of a wider range of damper products. The UL 555 Fire Damper code is now in its seventh revision since 1968 for both static and dynamic dampers. Static dampers are intended for applications where the HVAC system is immediately shut down upon detection of smoke or fire. Dynamic dampers are rated to close when elevated temperatures, velocity, and pressure occur. They are either spring- or actuator-assisted for closure. Dynamic dampers can close immediately while overcoming existing airflow resulting from air movement shut-down lag.

Common questions to answer when deciding on the need for a certain damper type include: "How long will it take for the airflow to be isolated?" "What if there is a fire or smoke detector failure?" The entire air control system does not need to be converted to dynamic for dynamic-rated fire dampers to be effective.

The UL 555S Smoke Damper code is in its fourth edition since 1983. Combination fire and smoke dampers are required to pass both UL 555 (dynamic) and UL 555S codes. Combination fire and smoke dampers are cycled 20,000 times and tested at minimum elevated temperatures of 250F or 350F against a minimum of 2,000 fpm velocity @ 4-in. w.g. of pressure. Extended temperature, pressure, and velocity ratings can be classified in increments of 100F, 1,000 fpm velocity, and 2-in. w.g. Actuators are now designed to operate at these elevated temperatures versus ambient conditions.

Refer to the "IBC Summary Requirements for Life Safety Dampers" sidebar on page 13 for damper selection criteria.

Get Involved

Today, regional IBC chapters around the country continue to advance important issues relevant to the safety and effectiveness of building structures. Hurricane-resistant construction in the southeast and seismic-resistant structures in the west are just two examples of how regional input has positively influenced the IBC. Everyone who understands the benefits that life safety dampers provide needs to become more involved at either a regional level or national level in the IBC. Systems that include both sprinklers and smoke-management devices need to work in conjunction with each other to provide the most effective ways to save structures and ultimately save lives. Get involved in your regional IBC chapter. You will be heard, and you can have an impact on establishing future IBC changes that will help preserve the important life safety progress that's already been achieved.

Mark A. Belke is director of Damper Products, Greeheck Corp., Schofield, WI, and current chair of the AMCA Code Action Review Committee. He can be reached at 715/692-6709 or Mark.Belke@greenheck.com.

Circle 9

Effective Smoke Control

Using Dampers with Electric Fire/Smoke Actuators

By Jeff Kirkwold

SOLUTIONS FOR CONTROLLING SMOKE, WHICH IS OFTEN THE PRIMARY CAUSE OF FIRE-RELATED DEATHS AND PROPERTY DAMAGE.

According to the National Fire Protection Association (NFPA), in 2005 there were 130,000 non-home structure fires; these resulted in 75 civilian deaths, 2,025 civilian injuries, and over $2.4 million in property damage[1]. Other studies show that most victims of fire die from smoke or toxic gases and not from burns[2]. Smoke is often the primary cause of property damage as well. These facts alone highlight the need for a balanced approach to fire and smoke management in commercial buildings, hospitals, multi-unit residences, and any other structures where people live, work, or spend their recreational time.

Well-designed smoke-mitigation or elimination systems can help reduce the probability of fire-related deaths and minimize the property damage caused by smoke. Fire/smoke dampers, equipped with electric actuators designed for fire/smoke applications, are an important component of these systems.

The Mechanics of Smoke Migration

Smoke migrates through a structure via five primary methods: stack effect, buoyancy, expansion, wind velocity, and through the HVAC system.

Stack effect refers to the movement of air caused by temperature differences between the indoor and outdoor air. This causes vertical movement of air within the structure – through elevator shafts, stairwells, mechanical shafts, and other vertical openings. The direction of movement, either up or down, depends upon whether the air inside a building is warmer or cooler than the outdoor ambient air temperature.

Normal stack effect occurs when the air outside the building is cooler than the indoor air. Air therefore moves upward from the bottom of the building and exits somewhere above the neutral plane (a plane roughly halfway up the building, although the location of this plane may differ considerably depending upon leakage paths in the building). Smoke then exits one of the fire shafts into the floors above the neutral plane and exits the building through openings in the exterior of the building.

Reverse stack effect is the opposite: the air inside the building is cooler than the outdoor air and causes air to move

in the downward direction. It should be noted that stack effect is most pronounced in taller buildings, but it can exist in a one-story building as well.

Buoyancy refers to the tendency of warm air or smoke to rise as a result of temperature differences. Note that buoyancy is differentiated from stack effect in that smoke can migrate downwards as a result of reverse stack effect; smoke migrates only upwards as a result of buoyancy. Buoyancy-induced pressure can cause smoke movement from the fire compartment to floors above the fire or through any leakage paths in walls or doors. As the distance from the fire increases, the temperature of the air decreases. Therefore, as we move further away from the fire, smoke migration as a result of buoyancy becomes less of an issue.

Expansion of hot gases as a result of the fire can cause smoke migration as well. Smoke migrates in any direction due to pressure differences caused by volumetric expansion. These pressure differences, and thus smoke migration as a result of pressure differences, can be significant depending on how well sealed a particular fire zone is – the better the sealing of the space, the higher the pressure drop across the barrier. This can cause a significant driving force for smoke migration.

Wind velocity is another means for smoke to migrate through a structure. The infiltration and exfiltration (movement of air into or out of a building, respectively) of air are hastened by wind effects and can therefore cause smoke migration. Open windows (or windows that have broken as a result of fire or other means) can be another means for

Effective Smoke Control, continued

wind to impact smoke migration. A broken window on the leeward side of a building can assist in eliminating smoke from a building. However, a broken window on the windward side can allow wind forces to move smoke throughout the fire floor or to other floors. As wind velocity increases, the migration effects can be more significant depending on how tightly sealed the building is. It should be noted that wind velocity generally increases with altitude. This puts taller buildings at a greater risk for smoke migration as a result of wind velocity.

Smoke can also migrate through a building via the ***HVAC system.*** The forced convection caused by fans can either distribute smoke within or exhaust smoke from the structure. In the early stages of a fire, the HVAC system can alert occupants that a fire has started by distributing the smell of smoke. But as the fire progresses, the HVAC system can cause dangerous levels of smoke to suffuse the building. Adding fresh air to the fire compartment serves to feed the fire, which only makes matters worse.

Smoke Control

Smoke control refers to use of smoke barriers in conjunction with airflow and pressurization (which are caused by mechanical fans). Smoke control via airflow requires air velocity of a sufficient magnitude to overcome smoke migration. In the limiting case of airflow, pressure differences caused by barriers can also serve to control smoke movement. We can intentionally control the mechanical system of a building in order to control smoke movement via the five primary methods of smoke migration outlined above.

The primary areas where airflow can be used to control smoke migration are doorways and corridors. Doors and corridors are the most commonly used means of egress from an affected area, and airflow can be used to mitigate the spread

Circle 10

Circle 11

RUSKIN STOPS FIRE & SMOKE

At Ruskin, we know that stopping the spread of fire and smoke is critical for preventing property loss and even death when building fires occur. That's why we're serious about performance. We match our industry leading fire, smoke and combination fire/smoke dampers with Honeywell H2000 actuators — test them to the toughest UL standards, and then back that up with third party performance certification from AMCA.

To learn more about Ruskin fire and smoke control solutions, or to locate a representative nearest you, visit our website at ***www.ruskin.com*** *or call us at* ***(816) 761-7476.***

Ruskin 25 Series offers:

- fire damper only or combination fire/smoke damper models
- true, round design, without transitions or collars
- unique "cinch plate" design for easiest installation in round duct systems
- extremely low pressure drop
- UL555S Leakage Class I rating (fire/smoke damper)

Ruskin 60 Series offers:

- fire, smoke and combination fire/smoke models
- exclusive "one-piece" airfoil blade design for greater strength
- extremely low pressure drop – even at higher velocities
- UL555S Leakage Class I rating (smoke and fire/smoke damper)
- contractor friendly versatile installations

Honeywell H2000 Actuator offers:

- reduced power consumption – only 9W during holding
- no special cycling required during long-term holding
- fast open and close operation in conformance with UL555S
- integral spring return for dependable operation
- no audible noise during holding
- direct coupled mounting with no linkage to slip

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Circle 12

Effective Smoke Control, continued

of smoke to unaffected areas, thereby increasing the odds of a safe exit from the building. However, it takes a good amount of airflow to prevent smoke migration through a constantly-open doorway. Therefore, airflow is not the primary means to control smoke movement – pressurization is.

Pressurization of a compartment requires a relatively tight barrier in order to prevent significant airflow out of the compartment. It should be noted that we can provide an allowance for a reasonable level of leakage during the construction and/or maintenance of a building such that pressurization is still a viable smoke-control strategy (which can minimize construction costs). We can then prevent the spread of smoke to a compartment by maintaining a sufficient pressure difference across the barrier, thereby providing a "safe" zone for occupants to use for egress or as a staging area for fire-protection personnel.

Not only do we need to provide a means to control smoke movement within a building, we need a way to provide a path for smoke to exit a building. Purging provides this mechanism.

Purging has a number of desirable outcomes. First, and most importantly, purging can provide sufficient dilution of compartment air so that occupants can successfully exit the building and fire fighters can maintain visibility during their work. Second, purging can provide a path for smoke movement so that the pressure of gas expansion due to the fire is abated. Since buoyancy causes smoke to rise, an exhaust path located near the top of a compartment and a source of air located near the lower part of the compartment (located in such a way that proper mixing of contaminated air with fresh air is accomplished) provides the best means for purging.

How To Affect Pressurization and Airflow

We can influence pressurization and airflow by intentionally controlling airflow to or from a compartment using duct fans and dampers outfitted with electric fire/smoke actuators that are compliant with UL Standard 555S.

Fire/smoke actuators that are compliant with UL 555S are fail safe – that is they fail in the closed position should power be lost to the actuator, either through a power failure or as a result of fire destroying the wiring to the actuator. This will aid the pressurization strategy in isolating a fire compartment from a path to safe egress, while preventing the spread of fire through the HVAC duct system.

The Role of Sprinklers

Clearly, the goal during any building fire is to extinguish the fire and minimize the impact on occupants and the building itself. To be sure, a balanced system, one that may include sprinklers as part of the fire system, can add an additional layer of safety for a building. Oftentimes the best means to extinguish a fire is via water sprinklers installed as part of a fire-control system. Sprinklers can reduce the ability of fire to spread as well as lower the overall temperature of the smoke emitted from the fire. However, as anyone who has gone camping and has tried to extinguish a fire with water can attest, applying water to a fire can generate enormous amounts of smoke. We still need to control migration of this smoke to ensure safety and visibility for building occupants and firefighters.

Creating Safe Environments

Safe environments are a right of all individuals. Providing safe environments is the responsibility of a host of players involved in the building and maintenance process. While we can never completely guarantee safety, we can, within reason, ensure that the building is safe to known risks. What we ultimately seek to accomplish is extinguishment of the fire and mitigation of smoke movement in order to protect life and property. However, in those cases where a fire may cause a total loss, we simply seek a short-term means of egress so we may prevent any loss of life. In this case, our goal is to temporarily overcome the primary means of smoke migration and allow ample time for egress.

Dampers outfitted with electric fire/smoke actuators compliant with UL 555S are among the best tools available to keep buildings safe. Engineers who are provided these tools, along with good building control systems, have an effective means to protect the lives of occupants and firefighters, as well as the ability to provide protection from significant property damage.

References

1) www.nfpa.org

2) www.bestqualitysafety.com

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Damper Leakage Rates –

More Important Than Ever

By John Knapp

Guidelines for specifying damper performance.

All HVAC dampers, i.e., control, backdraft, fire, smoke, and combination fire/smoke, contribute to the overall efficiency of the air system. With the emphasis on "green," sustainable buildings, IAQ, and energy savings, damper leakage rates are more important than ever. Every CFM counts!

The International Energy Conservation Code (IECC) and ASHRAE Standard 90.1 *Energy Standard for Buildings Except Low-Rise Residential Buildings* state that dampers integral to the building envelope should have "a maximum leakage rate of 4 cfm per square foot (21 L/s per square meter) at 1.0-in. w.g. (0.25kPa) when tested in accordance with AMCA 500D." But what do these requirements really mean?

Dampers generally leak in two main places: between the blade ends and the frame, an area typically known as the "jamb," and between the blade edges. Therefore, low-leakage dampers are normally supplied with blade and jamb seals. However, the type of seal supplied can mean significant differences in leakage rates. There can be a 10-to-1 difference in a damper supplied with mechanically locked seals and flexible metal jamb seals versus a damper supplied with no seals at all.

AMCA Publication 502, *Damper Application Manual for Heating, Ventilating and Air Conditioning,* defines the "sealing performance" of a closed damper as "described by the airflow leakage rate through the damper for a given pressure differential across the damper." So leakage is a function of pressure, not airflow. This sealing performance is usually expressed (or plotted) as cfm/sq.ft. (m^3s per m^2) through the face area of a damper versus measured pressure differential across the damper and includes a statement of the specified seating torque. For example, a 24x24-in. opposed blade damper may have its sealing performance described as 32 cfm/sq.ft. @ 4-in. w.g. pressure with 5 inch-pounds/sq.ft. torque applied holding damper closed. This is a lot of information, but all necessary when a specifier or end-user is comparing information from one manufacturer to another.

Published leakage data of dampers are usually expressed as cfm/sq.ft. of damper at 1.0-in. w.g. static pressure. Once you know how much a damper will leak at 1 inch, it is easy to *estimate* the leakage at other pressures using the basic fan laws.

To find the leakage at other pressures, simply multiply the leakage at 1 inch times the square root of your actual pressure.

For example, if a damper leaks 10 cfm/sq.ft. at 1.0-in. w.g. pressure, to find the leakage at 4.0-in. w.g. pressure, simply multiply 10 times the square root of four (two) and you can estimate that the damper will leak approximately 20 cfm/sq.ft. at 4.0-in. w.g. pressure. However, you must be careful when using this technique. Be sure the damper is designed to withstand the actual pressure. It will do no good to approximate the leakage of a damper at 9.0-in. w.g. of pressure if the damper is designed to withstand only 3.0-in. w.g. – you will see considerably more leakage as the damper blades deflect or bend due to the higher pressure.

Leakage is a Function of Pressure

Leakage performance should not be specified or described as a percentage of flow. Percentage of flow leakage criteria is not useful in most cases. As stated before, leakage is a function of pressure, and not airflow. If you have a system that operates at 2,000 ft./min. and another that operates at 500 ft./min., a 1% of flow leakage specification would allow four times as much leakage through the same size damper. For example, a 12x12-in. damper would be allowed 20 cfm leakage in the larger system. The same damper under the same stipulation would be allowed 5 cfm in the smaller system.

Damper Leakage Rates, *continued*

Damper manufacturers test their products to AMCA Standard 500-D, *Laboratory Methods of Testing Dampers for Rating.* This standard includes recognized and accepted standard test procedures for performance testing, including sealing performance. There are many test centers that can test dampers to the procedures in AMCA Standard 500; many manufacturers have the ability to test their own products. Should a specifier or owner want impartial data that a damper will perform, they should specify that the damper comply with AMCA Standard 511, *Certified Ratings Program – Product Rating Manual for Air Control Devices.*

AMCA 511 details procedures for participation in the AMCA Certified Ratings Program (CRP). Manufacturers having their products tested in an AMCA-accredited laboratory, with the test results verified by the AMCA staff and then obtaining the proper license from AMCA, can offer products bearing AMCA's Certified Ratings Seal for Air Leakage. The purpose of the seal is to offer assurance that a damper will perform in accordance with the manufacturer's published data. Therefore, if a particular damper's ratings comply with the performance criteria specified, it should produce an acceptable application, provided all other requirements are satisfied.

Bearing the seal doesn't stop with the first round of testing. All of the manufacturer's literature must be verified for accuracy before publication. The ratings are subject to review at all times by AMCA and the products are "check-tested" on a minimum three-year basis to make sure that the products perform as required. And all licensed products are open to challenge testing by competitors or any third party.

AMCA 511 also introduces us to damper "Leakage Classes." **Chart 1** illustrates each damper classification.

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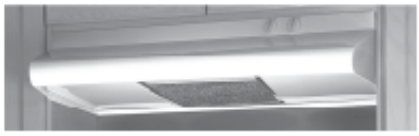
RESIDENTIAL FANS

Bathroom Exhaust Fan

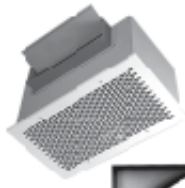

Kitchen Exhaust Hood

Fan Light & Fire Radiation Damper

Dryer Booster Exhaust Fan

Inline Exhaust Fan

COMMERCIAL FANS


Inline & Ceiling Cabinet Exhaust Fan

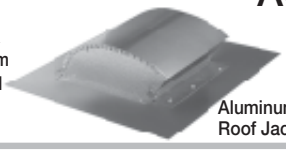
Tubeaxial Fan

Belt Driven Propeller Wall Exhaust Fan BE Series

Direct Drive Propeller Wall Exhaust Fan

ACCESSORIES

Wall Box Aluminum Extruded Louver


Aluminum Roof Jack

Aluminum Wall Cap

Inline Back Draft Damper

Speed Controller

Electronic Fan/Time Light Delay Switch

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Circle 13

Chart 1: Leakage Classifications per AMCA Standard 511

Pressure/ Class	Leakage, cfm/ft² (L/S/m²)			
	Required Rating		Extended Ranges (Optional)	
	1" w.g. (0.25kPA)	4" w.g. (1.0kPA)	8" w.g. (2.0kPA)	12" w.g. (3.0kPA)
1A	3 (15.2)	8 (40.6)	11 (55.9)	14 (71.1)
1	4 (20.3)	8 (40.6)	11 (55.9)	14 (71.1)
2	10 (50.8)	20 (102)	28 (142)	35 (178)
3	40 (203)	80 (406)	112 (569)	140 (711)

Chart 2: UL555S Classified Leakage Ratings

Leakage Class	Leakage, cfm/ft² (L/S/m²)		
	4" w.g. (1.0kPA)	8" w.g. (2.0kPA)	12" w.g. (3.0kPA)
I	8 (40.6)	11 (55.9)	14 (71.1)
II	20 (102)	28 (142)	35 (178)
III	80 (406)	112 (569)	140 (711)

Earlier we covered the requirements of the IECC and ASHRAE Standard 90.1. Using the AMCA 511 table, we now see that both the IECC and ASHRAE require Class 1 dampers.

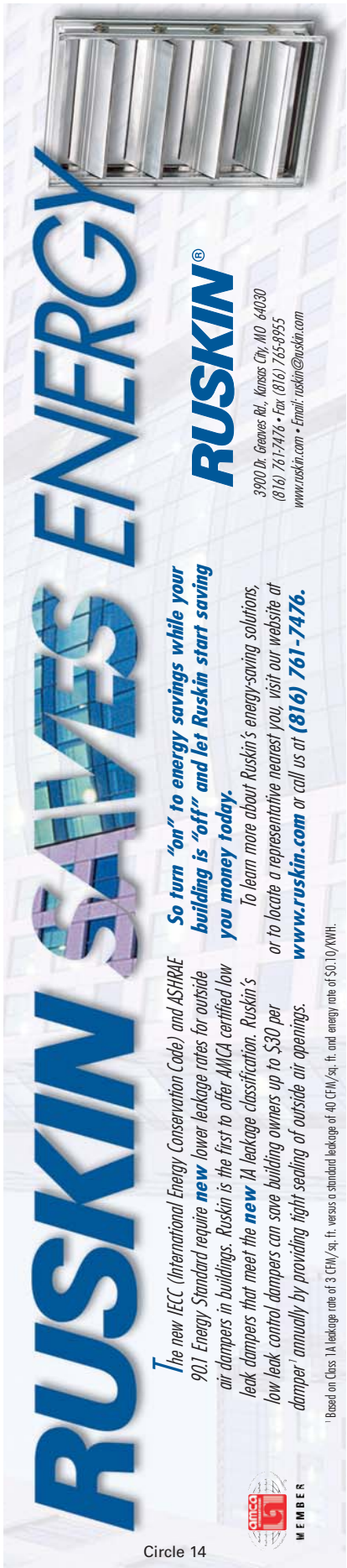
UL Classified Leakage Ratings

UL Standard 555S, Smoke Dampers, is the test standard to qualify dampers for use in smoke-control systems. UL 555S identifies leakage classes for both smoke and combination fire/smoke dampers (combination fire/smoke dampers must meet the requirements of both UL 555, *Fire Dampers,* and UL 555S). **Chart 2** identifies the different leakage classes under UL 555S.

Note the similarities between the leakage classes in both AMCA 511 and UL 555S. They are the same except that UL 555S does not have a Leakage Class 1A nor does it allow leakage ratings at 1-in. w.g. (0.25kPA). Anyone specifying a leakage class can feel comfortable knowing that the class is essentially the same for all damper types and styles. Moreover, AMCA 511 also includes procedures to qualify smoke and fire/smoke dampers to bear AMCA's Certified Ratings Seal for Air Leakage.

Understanding damper leakage rates and leakage classes enables specifiers, contractors, and building owners to identify the correct damper products. Specifying and installing low-leakage dampers (Class 1 preferred, Class 2 at a minimum by code) helps ensure that the building HVAC system is operating at its most energy-efficient level. Specifying and installing dampers licensed to bear the AMCA Seal for Damper Leakage is a sensible way to provide specifiers, contractors, and owners peace-of-mind that the dampers in their systems will perform as intended and help take their buildings to the "green," sustainable level.

John Knapp is vice-president of sales and marketing for Ruskin Co., Grandview, MO. He can be reached at 816/965-4310 or jknapp@ruskin.com.



FAN SYSTEMS

In-line Fans: *Considerations for Sizing*

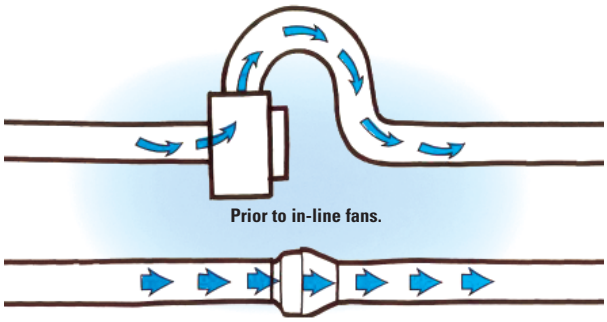
WHERE AND HOW IN-LINE FANS CAN BE USED AS AN EFFECTIVE ALTERNATIVE TO OTHER MECHANICAL VENTILATION OPTIONS IN COMMERCIAL AND RESIDENTIAL APPLICATIONS.

Since their invention in 1974, round in-line duct fans have been a real problem-solver in commercial and residential ventilation projects. The simple circular design – with duct inlet in-line with duct outlet – allows these fans to be easily installed in ductwork. System effect losses traditionally caused by the necessary bends needed to duct in and out of traditional duct fans are not incurred. Installed performance therefore more easily matches design values. As always, look for products that are licensed to bear the AMCA seal in order to ensure that the fan performs as advertised.

Space-Efficient, Cost-Effective

Mechanical space, space for ducting, and distance between floors are at a premium in today's buildings. In-line fans provide a space-efficient option for mechanical ventilation or duct boosting.

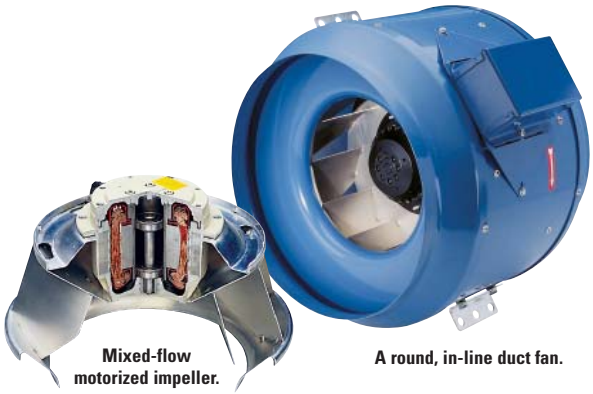
In-line fans are cost-effective to install and easy to access for maintenance. They are often chosen when a roof or wall-mounted fan is not feasible or regarded as unattractive. Also,



In-line fans – the straight way.

when noise on the outside of the building is an issue, an in-line fan provides the opportunity to attenuate the noise through the use of a silencer between the fan and the register on the outside of the building.

Most in-line fan wheels are of centrifugal or mixed-flow design, using impellers to build the pressure needed for ducted installations.



Mixed-flow motorized impeller.

A round, in-line duct fan.

Commercial Applications

Mechanical exhaust or supply-air systems are good applications for in-line fans. For example, air is usually exhausted from bathrooms through a series of ceiling-insert fans. By using in-line fans, a series of exhaust registers can be ducted to each fan. In addition to reducing the cost and the number of fans to maintain, a silencer or section of flexible ducting can be used to make the system extremely quiet. Dampers or adjustable registers can be used to balance the system to achieve the desired airflow through each register.

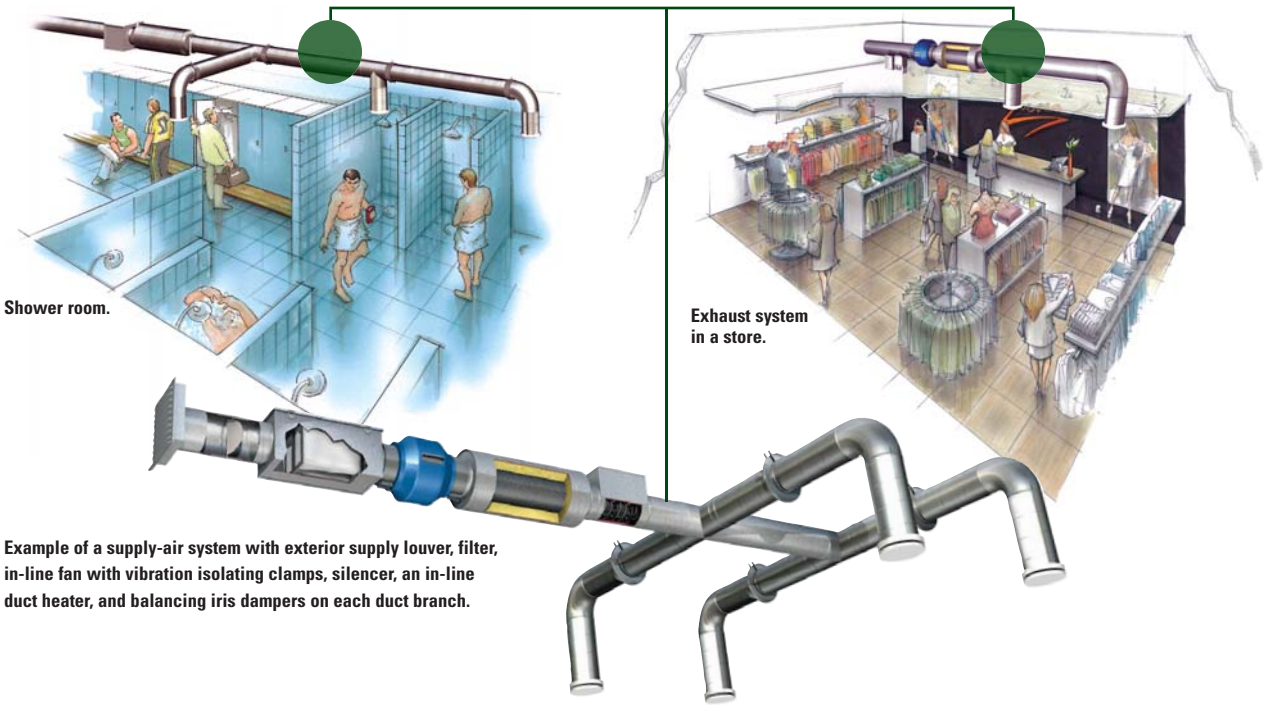
In order to minimize installation and operation costs, and to keep space requirements small, it is often effective to break the exhaust system up in 500 to 4,000 cfm subsystems. Each sub-system can be operated only when needed, and can either be individually ducted to the outside or into a common duct. If the sub-systems are combined into a single exhaust duct, it is essential that backdraft dampers are used for each fan.

In commercial applications, supply-air systems are commonly used. Supply-air systems are often combined with kitchen exhaust systems to provide make-up air, as well. Again, the in-line fan can be located above a drop ceiling or in a mechanical space, with ducts leading to the various supply registers. A MERV 6 filter is generally required in supply-air systems (check applicable codes).

In-line fans are also commonly used as duct boosters. By installing an in-line fan in a branch of a ventilation system, airflows can be brought to desired values, either in initial design or as a field correction after the fact. Vibration isolators and silencers are recommended.

& Selection

By Ola Wettergren



Shower room.

Exhaust system in a store.

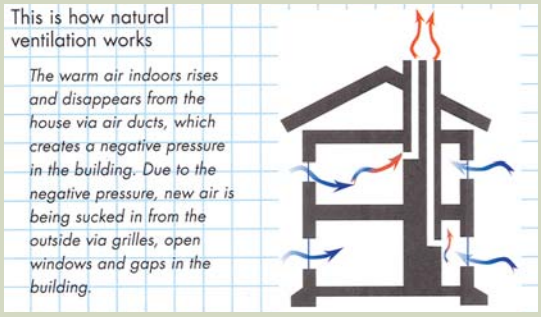
Example of a supply-air system with exterior supply louver, filter, in-line fan with vibration isolating clamps, silencer, an in-line duct heater, and balancing iris dampers on each duct branch.

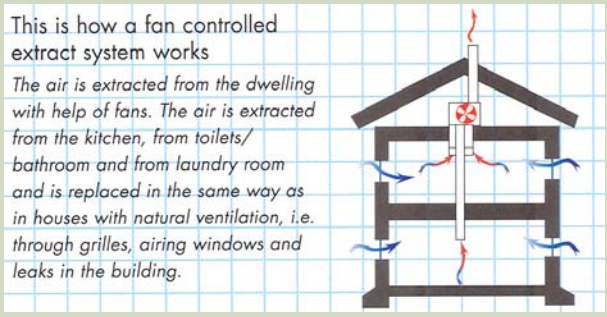
Why Ventilation?

Ventilation is the key to improving indoor air quality in the buildings where we work and live.

Ventilation can be natural, hybrid, or mechanical. Years ago, buildings had plenty of natural ventilation. Gaps around windows and doors allowed fresh air to penetrate the structure. Since the 1970s, however, buildings have been built so tight that ventilation systems are now a necessity.

Windows are no longer opened very often for both security and comfort reasons (noise/draft). When they are opened, the ventilation rates are no longer controlled. While a few generations back it was common to have 30-degree differences between different areas of a structure, occupants now demand that all areas be within a couple of degrees. Maintaining at least minimum ventilation rates is imperative. In order to achieve these design goals, mechanical ventilation is best used to control ventilation rates.





In-line Fans, continued

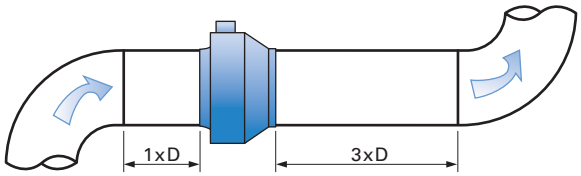
System Design and Installation

Fan selection is no different when using in-line than other fan solutions, such as roof-mounted or ceiling-insert fans.

An advantage of in-line fans is that system effect losses can be minimized in the installation. **Figure 1** shows guidelines for minimum straight sections before and after the fan. Follow these guidelines to minimize system effect losses.

Ventilation systems should be quiet enough not to bother the occupants. Silencers are very effective in reducing the sound power through the registers. For many applications, especially residential, a section of insulated flexible duct can act as an effective silencer. Manufacturers supply insertion loss data in each frequency band, allowing engineers to calculate the sound power to the registers.

In order to avoid structure-borne sound when using in-line fans, vibration-isolating duct attachments and hangers are recommended. For round duct, inexpensive vibration-isolating



For a rectangular duct, the equivalent round duct diameter is:

$$D = \sqrt{\frac{4 - h - w}{\pi}}$$

D = duct diameter
H = duct height
W = duct width

Figure 1. Guidelines for minimum straight sections before and after the fan.

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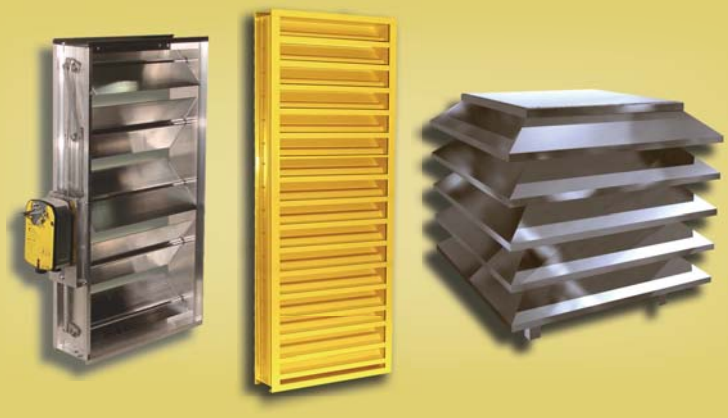

Expanded Louver Line
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- Thin Line
- Wind Driven Rain
- Hurricane (Miami-Dade approved)

Control Dampers
- Opposed or parallel blade
- Aluminum or galvanized
- Low leakage
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Penthouses
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- Aluminum or galvanized
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Circle 15

duct clamps with integral hangers are readily available. Properly installed, breakout or structure-borne noise is seldom an issue.

On-Demand Ventilation

On-demand ventilation allows us to only ventilate as much as we need to, reducing ventilation rates when spaces are unoccupied. Examples of possibilities for controlling ventilation per demand include CO_2 or humidity-controlled ventilation, motion sensors, user-controlled timers, and weekly timers. Using silicon-controlled rectifier (SCR) proportional speed controls, VFDs, or transformers connected to logical controls, fan speed can inexpensively and reliably be controlled as needed. Electronically commutated (EC) motors are very efficient compared to conventional motors, especially at reduced rpm. EC is therefore a good option in demand-controlled systems, where the fan operates at low outputs for a large portion of the time. So far, availability of EC motors in fans is limited and payback periods long, but we anticipate that costs will come down in the next few years, making EC a more attractive alternative. For now, conventional permanent-split capacitor (PSC) or three-phase motors are the usual choices for demand-controlled ventilation.

Residential Applications

In-line fans are effective alternatives for continuous exhaust applications to fulfill ASHRAE 62.2 ventilation requirements. With two or more exhaust registers, typically in the bathrooms and kitchen, good mixing of the air is ensured. Fans can also be controlled to run continuously at low speed, with controls that activate high speed when a bathroom is occupied, giving a cost-effective combination of continuous and bathroom ventilation. Using insulated flexible ducting between registers and fans (an 8-ft. length is usually sufficient), the systems become very quiet.

Many residential bathrooms have enclosed toilets and showers. In-line fans allow for installation of registers inside each of these spaces. Clients appreciate the smaller ventilation openings and effective exhaust of odors and moisture at the source, as opposed to a single fan in the middle of the room. Registers are available with or without integral lights.

In-line fans are also commonly seen in residential dryer booster applications, as well as in high-capacity residential kitchen range hoods in conjunction with silencers.

The in-line fan applications described here represent only a few typical examples of how the fans are used to provide air movement solutions in residential and commercial projects. In-line fans are gaining popularity in North America but are much more commonly used in Europe, where the round in-line fan originated. We anticipate that in-line fans will be a more common choice for engineers and HVAC contractors in the future.

Ola Wettergren, MS Aeronautical Engineer, is president of Fantech and Kanalflakt, Sarasota, FL. He can be reached at 800/747-1762 or olwe@fantech.net.

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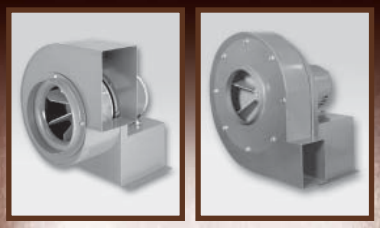

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- Belt Drive Propeller Fans
- Plenum/Plug Fans
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Some key features of the Radial Blade Blower Models PW and KE shown above include:

- Wheel Sizes: 8"-14"
- Model KE CFM Range: 93- 3,393
- Model PW CFM Range: 70-2,100
- Static Pressure: Model KE: Up to 2.25" WG Model PW: Up to 12" WG
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AMCA News, *continued from page 7*

AMCA International Engineering Conference 2008

The next AMCA International Engineering Conference is scheduled to be held March 2-4, 2008, in Las Vegas. The conference will be held in conjunction with the Sales and Marketing Executive Council meeting, the HR/ME Council meetings, the spring HVAC/Fire & Smoke Damper engineering committee meetings, and the AMCA/UL meeting.

Member companies are encouraged to be represented. Newer and senior engineers alike will benefit from hearing about developments in the industry. Some outside papers will be presented in addition to those presented by AMCA International engineers.

Marketing Committee Update

The marketing committee is dedicated to fulfilling the goals of the AMCA Strategic Plan and, along with AMCA staff, has been working diligently on several new and exciting projects including the improvement of the AMCA Web site. The newly designed site is scheduled to debut at the January 2008 AHR/ASHRAE Expo.

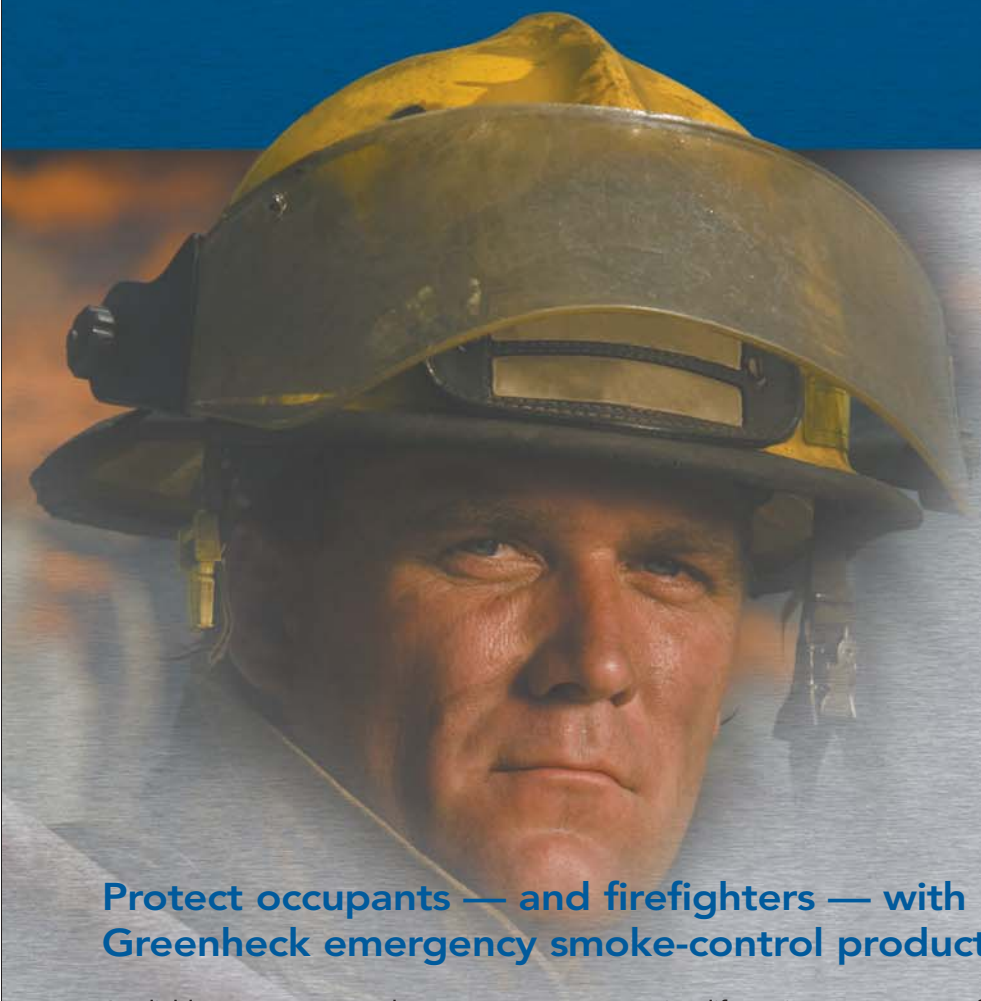
The committee is also working on the filming of an AMCA corporate promotional video. This new video is intended to be used for marketing the association during trade shows and will be distributed at universities, providing increased exposure to students and instructors. Stay tuned to this column for updates on the progress of these and other projects.

Standards and Publications Update

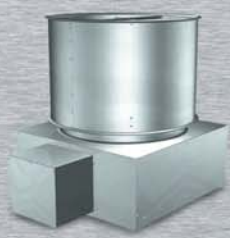
- AMCA International has expanded an ISO/IEC 17025 accreditation scope to include acoustic tests on fans, louvers, and reference sound sources. The scope expansion also includes air and sound testing of residential fan units to HVI Publications 915 and 916. The accreditation was granted to AMCA's laboratory after a rigorous evaluation process by the American Association for Laboratory Accreditation.
- AMCA International's testing laboratory is currently underway with ASHRAE Research Project RP1272, *"Inlet Installation Effects on Forward-Curved Centrifugal Fans, Air, and Sound."* The goal of this project is to obtain a body of measured inlet system effects for a typical forward-curved centrifugal fan using ANSI/AMCA 210/ASHRAE 51 and AMCA 300.
- AMCA Standard 320-07, *"Laboratory Methods of Sound Testing of Fans,"* was approved in May. This standard establishes a method of determining the octave band sound power levels of a fan. The method is reproducible when all requirements of the method are met.
- AMCA International recently approved revisions to two AMCA publications. The first, *AMCA Publication 511, "Certified Ratings Program - Product Rating Manual for Air Control Devices,"* should be used in conjunction with the current edition of AMCA Publication 11. The second, *AMCA Publication 311, "Certified Ratings Program – Product Rating Manual for Fan Sound Performance,"* applies only to complete air moving devices that are already licensed to bear the AMCA Certified Performance Seal for Air Performance. One of two major revisions allows sone ratings to be published based on a spherical free field model of noise at a distance of 1.5 meters. The other major revision allows sone ratings to be calculated using one-third octave bands. These changes will allow manufacturers to rate their fans with greater accuracy.

For details and more AMCA news, go to ***www.amca.org.***

Keep [air] smoke-free for everybody.



Utility Fans



Roof Mounted Exhaust Fans

Propeller Inline Fans

Smoke & Fire Smoke Dampers

Protect occupants — and firefighters — with Greenheck emergency smoke-control products.

A reliable emergency smoke management system is a life-saving component of any building's design. Clearing and blocking dangerous smoke from rooms, hallways and stairwells helps occupants breathe and see during evacuation procedures — and helps to safeguard emergency crews as they go about their work.

Greenheck offers a full line of smoke-control products licensed by AMCA and listed with UL/cUL, including centrifugal and propeller rooftop upblast fans, inline propeller fans, and a complete line of smoke and fire dampers. These products can be integrated into a dedicated fire/smoke emergency system, or serve double-duty as components of your everyday ventilation system.

As the industry leader, Greenheck is able to meet whatever air movement and control challenges you face, from simple to complex. For full product specifications and more information, visit our Web site or contact your nearby Greenheck rep.

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Centrifugal & Vane Axial Fans | Fans & Ventilators | Energy Recovery Ventilators | Make-up Air Units | Kitchen Ventilation Systems | Dampers | Louvers | Lab Exhaust Systems

Delhi Industries releases Delair 8.0.0.

Delair allows for easy fan selections, preparation of submittal documents & a link to Delhi's online customer service website for access to inventories, order status, tracking numbers etc. Release 8.0.0 contains information on new products such as airfoil plenum fans, direct drive square inlines & floaire PRV's. Available at ***www.delhi-industries.com*** or e-mail ***software@delhi-industries.com*** (Circle 19)

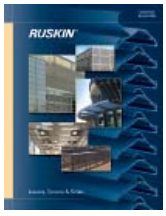
Square Inline Blowers

Delhi Industries Square Inline Blowers (DSQ) literature has been released with direct drive blowers. The direct blower (DSQ-D) is available in four sizes from 10" to 15".The belt drive blower (DSQ-B) is available in ten sizes from 10" to 27". Both models are certified for AMCA air & sound performance. Information available at ***www.delhi-industries.com*** or e-mail ***info@delhi-industries.com*** (Circle 21)

ACMAXX: The new generation of ac fan technology

ebm-papst's new ACmaxx technology is extremely versatile and can be used from 85 – 265 v, 50 & 60 Hz for the worldwide voltages. With up to 75% lower power consumption, the ACmaxx allows for a cost savings of at least 50% over standard AC fans! The ACmaxx will revolutionize the way you think about AC. ***www.ebmpapst.us*** (Circle 20)

Ruskin's Louvers, Screens and Grilles



The new Ruskin Louvers, Screens and Grilles Brochure highlight their most popular wall louver, equipment screen and decorative grille products. Included in the new 2006 edition are Ruskin's Miami-Dade County approved Hurricane Louvers, which were the first louvers to gain Miami-Dade product approval. Included in this year's edition is their new Miami-Dade approved EME520MD Hurricane Louver which is impact resistant and provides "Class A" performance when tested in AMCA's Wind Driven Rain Penetration test.

To learn more about Ruskin dampers, louvers and sound control products visit our website at ***www.ruskin.com***, or call 816-761-7476. (Circle 22)

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