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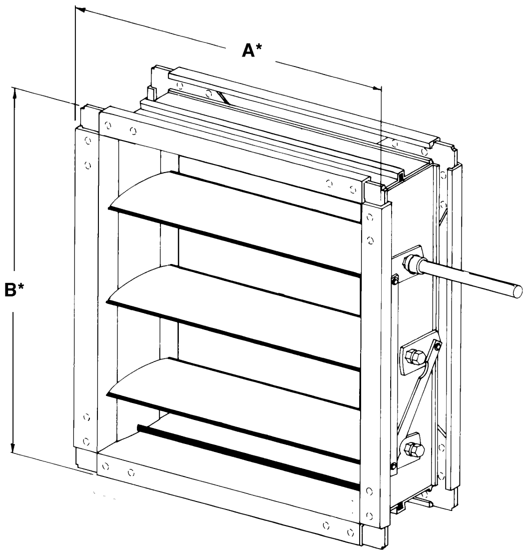
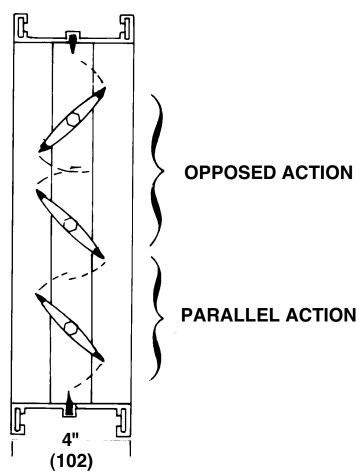
4RAFBCD3 THIN LINE LINEAR CONTROL DAMPER

EXTRUDED ALUMINUM





OPPOSED/PARALLEL BLADES

NOTE: 4RAFBCD3 is not recommended for installation with blades running vertically.

STANDARD CONSTRUCTION

FRAME
4" x 1" (102 x 25) x 6063T5 extruded aluminum hat channel with .081" (2) minimum wall thickness. Mounting flanges on both sides of frame.

BLADES
3" (76) wide, 6063T5 heavy gage extruded aluminum, airfoil shaped blades with integral structural reinforcing tube.

LINKAGE
Concealed in frame.

AXLES
1/2" (13) plated steel hex.

BEARINGS
Molded synthetic.

SEALS
Blade Edge - Extruded Reliableprene (TPR) for -72°F to +275°F (-58°C to +135°C).
Jamb - Flexible metal compression type.

CONTROL SHAFT
6" x 1/2" (152 x 13) diameter. Outboard support bearing supplied with all single section dampers for field mounted actuators. Factory-installed jackshaft supplied with all multiple section dampers.

FINISH
Mill.

MINIMUM SIZE
Three blades – 6"w x 11"h (152 x 279).
Two blades, 100% OB or PB – 6"w x 8 1/2"h (152 x 216).
Single blade, 100% PB – 6"w x 5 1/2"h (152 x 140).

MAXIMUM SIZE
Single section – 48"w x 72"h (1219 x 1829).
Multiple section assembly – Unlimited size.

FEATURES

The Reliable 4RAFBCD3 thin line control damper features a low profile, airfoil blade design and incorporates parallel and opposed action within the same frame. Percentage of opposed action is specifiable. These features enable this damper to provide the linear curve performance ideal for fresh and return air applications.

OPTIONS

Variations to standard design are available at additional cost and include:

- Anodize finishes for corrosive atmospheres
- Special finishes for other requirements
- Factory-installed, pneumatic and electric actuators
- Frame-mounting bracket for simple field installation of most actuators.
- Front or rear flange frame.
- Face and bypass mixing damper assemblies (see page 4).

Dimensions shown in parenthesis ( ) indicate millimeters.

*Unit furnished approximately 1/4" (6) smaller than given opening dimensions.

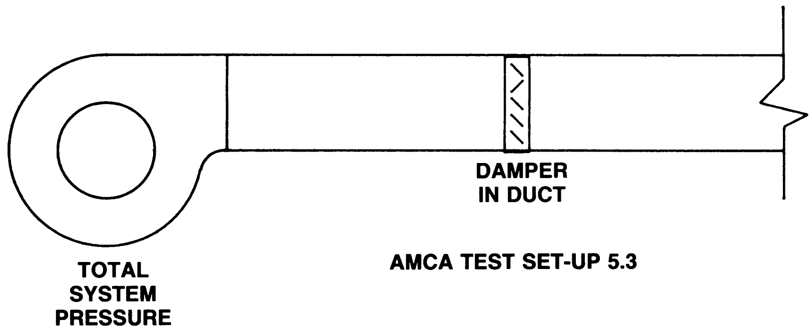
QTY.	DIMENSIONS				BLADE ACTION			FRAME STYLE			VARIATIONS
	A*	B*	A^1	B^1	100% PB	100% OB	% OB	STD.	Front Flange FF	Rear Flange RF	
JOB								LOCATION			
CONTRACTOR											

ALL STATED SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE OR OBLIGATION.

MODEL 4RAFBCD3

Typical control dampers have blades that operate parallel to each other (PB) or that rotate in opposite directions (OB). Parallel and opposed blades also differ from an air flow characteristic standpoint. Parallel blade dampers have an open area of more than 50% between blades when the damper is at mid travel point. Opposed blade dampers have less than 50% open area at mid travel.

Reliable's Model 4RAFBCD3 damper offers both parallel and opposed blade operation at the same time. This gives more desirable linear air flow performance. The small 3" (76) blade in Model CD403 enables you to closely design the percentage of opposed blades versus parallel blades for the application and to gain air flow performance impossible to achieve with a 6"

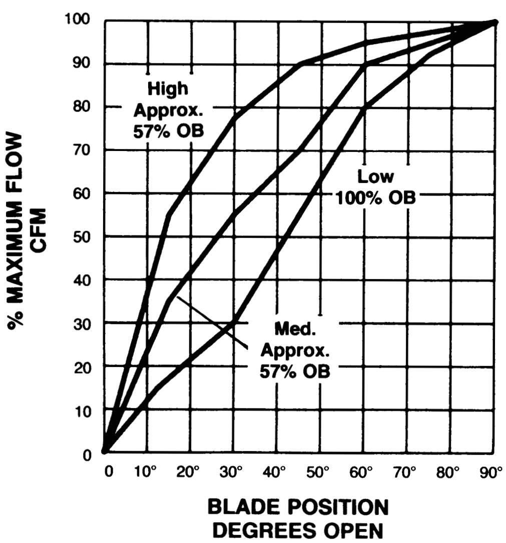


AMCA TEST SET-UP 5.3

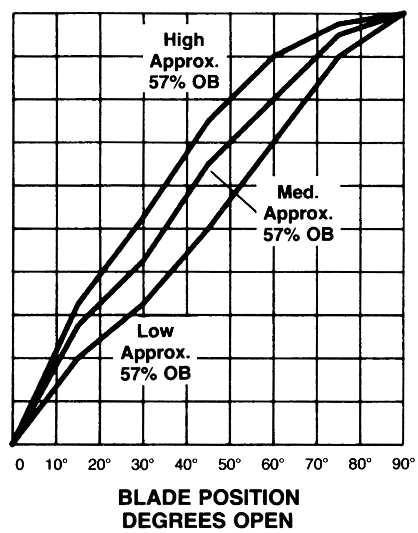
DUCTED APPLICATIONS

A typical ducted control damper application for Model 4RAFBCD3 is depicted. The various graphs with high, medium, and low static pressure systems and 1000, 2000, and 3000 fpm face velocities will help you select the correct Model 4RAFBCD3 configuration for ducted applications. Select your duct velocity, refer to the appropriate chart and appropriate static pressure – low (2" w.g.), medium (5" w.g.), or high (10 w.g.). The chart will give the appropriate percentage of opposed blade versus parallel blade you need to achieve linear air flow performance.

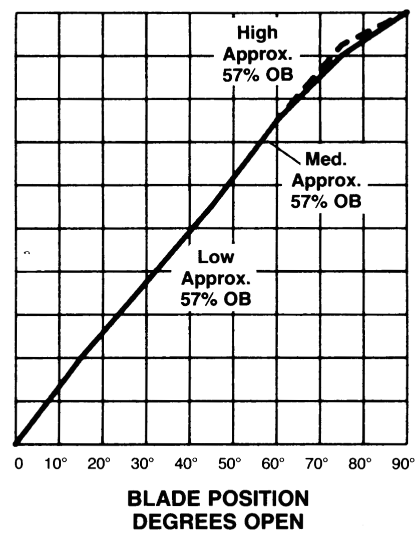
The air flow curves shown are selected from wind tunnel air flow testing and represent the optimum selection that can be determined for the velocity and system static pressure involved. Not all curves are shown as linear; other combinations will result in a greater variance than depicted. As shown in the curves below, the most constant blade selection for ducted applications is approximately 57% opposed blade.



1000 FPM



2000 FPM



3000 FPM

EXAMPLES:

1. 24" x 36" (610 x 914) (6 sq. ft.) damper with 13,000 cfm and 5" w.g. static pressure fan system.

   Divide the cfm by the damper square footage to determine fpm.

   $\frac{13,000}{6}$ = 2166 fpm

   Use the 2000 fpm chart and the medium pressure (5" w.g.) curve to determine that a 57% (approx.) opposed blade damper provides the most linear performance for the application.

2. 24" x 24" (610 x 610) (4 sq. ft.) damper with 4,000 cfm and 2" w.g. static pressure.

   Divide the cfm by the damper square footage to determine fpm.

   $\frac{4,000}{4}$ = 1000 fpm

   Use the 1000 fpm chart and the low pressure curve to determine that 100% opposed blade damper is ideal for a low pressure system.

MIXING BOX SYSTEMS

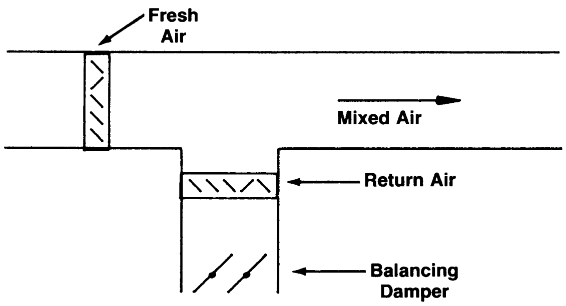
This example depicts a mixing box system with fresh air and return air dampers of equal size. Both are ducted on the inlet side.

Mixing box performance differs from ducted performance. The percentage of opposed blades versus parallel blades selected and shown is based upon air flow testing with equal pressure drop for both outside air and return air. The optimum opposed blade versus parallel blade damper configuration is depicted.

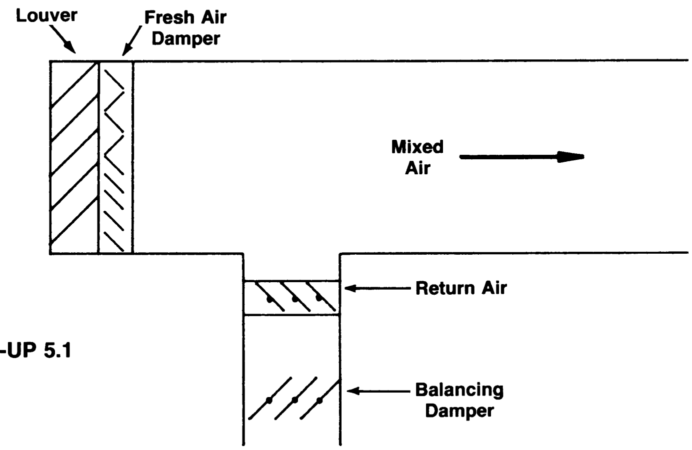
This example depicts a fresh air damper and louver of the same size and a return air damper half the size of the outside air damper.

The return air damper is all parallel operation to achieve better mixing. The percentage of opposed blades is varied in the fresh air damper to achieve as close to linear air flow as possible. Optimum damper configuration is depicted.

TWO DAMPERS EQUAL SIZE



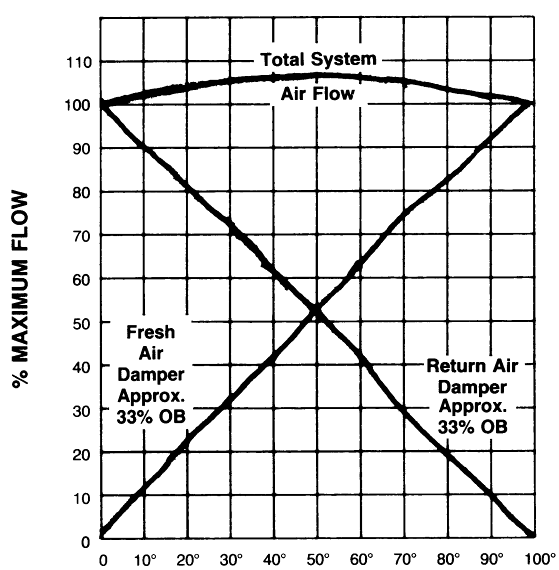
MIXED AIR WITH LOUVER



AMCA TEST SET-UP 5.1

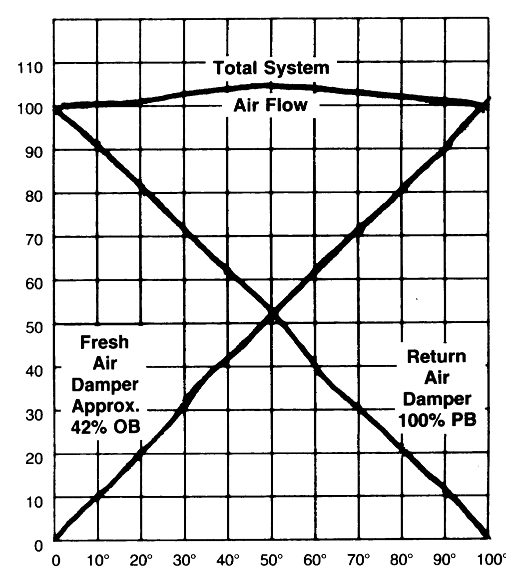
FACE AND BYPASS APPLICATION

These curves show the best damper combinations for the two applications.



% MOVEMENT

With equal damper sizes, the return air and fresh air dampers should both be 33% (approx.) opposed blade action.



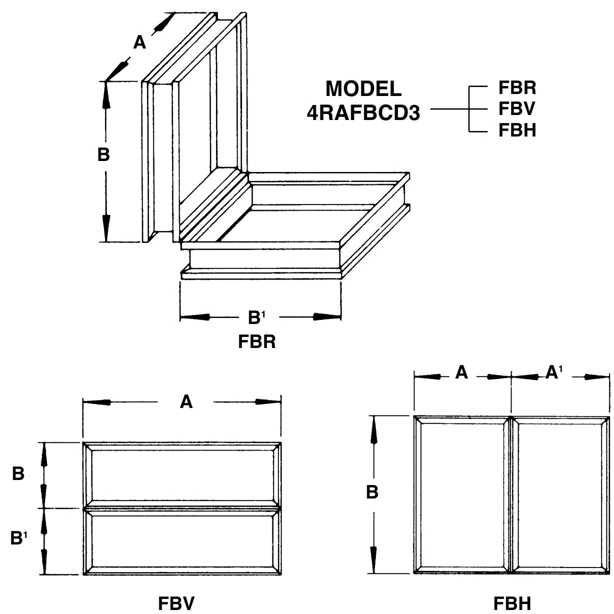
% MOVEMENT

When the damper is mounted next to the louver with approximately 500 fpm face velocity and the return air damper is sized for 1000 fpm face velocity, the best selection would be an all parallel blade return air damper and a 42% (approx.) opposed blade fresh air damper.

SUGGESTED SPECIFICATION

Furnish and install, at locations shown on plans, or in accordance with schedules, low leakage airfoil damper with combination opposed blade and parallel blade action linkage in the same damper frame. Frames shall be 4" x 1" x .081" (102 x 25 x 2) extruded aluminum channel. Blades must be 3" (76) maximum width so that the percentage of opposed blades can be closely controlled. Airfoil blade construction shall be extruded aluminum with integral structural reinforcing tube running the full length of each blade. Double edge blade seals shall be extruded vinyl with inflatable pockets which enable air pressure from either direction to assist in blade-to-blade seal. Blade seals shall be mechanically locked in extruded blade slots. Adhesive or clip-on type blade seals are unacceptable. Bearings shall be non-corrosive molded synthetic. Hexagonal axles shall provide positive locking connection to blade and linkage. Linkage is concealed within the frame. Damper manufacturer's literature shall be submitted for approval prior to installation and shall include performance data on pressure limitations, leakage, and linear flow developed from testing in accordance with AMCA Standard 500. Damper shall be equivalent in all respects to Reliable Model 4RAFBCD3.

FACE and BYPASS MIXING DAMPERS



Dampers larger than maximum single section are an assembly of equal size single section dampers (maximum section size 48"w x 72"h [1219 x 1829]) and may be coupled for operation in a variety of ways. A 1" (25) diameter jackshaft is normally used for multiple section coupling as illustrated above.

Larger multiple section damper assemblies require an analysis of how the damper is to be operated (how many and what type of actuators) before the best method of coupling sections can be determined. Special assembly drawings are normally prepared and forwarded for customer review on larger damper assemblies.

Examples: A 72" x 60" (1829 x 1524) damper would be an assembly consisting of two 36" x 60" (914 x 1524) damper sections.

A 102" x 100" (2591 x 2540) damper would be an assembly consisting of six 34" x 50" (864 x 1270) damper sections.

PERFORMANCE

TOTAL CFM LEAKAGE AT 1" W.G. STATIC PRESSURE DIFFERENTIAL

DAMPER WIDTH (INCHES)	DAMPER HEIGHT (INCHES)										
	12" (305)	18" (457)	24" (610)	30" (762)	36" (914)	42" (1067)	48" (1219)	54" (1372)	60" (1524)	66" (1676)	72" (1829)
12" (305)	3	4	6	7	9	10	12	14	15	16	18
24" (610)	6	9	12	15	18	21	23	26	29	32	35
36" (914)	9	13	18	22	27	31	35	40	44	48	53
48" (1219)	11	16	22	27	33	38	43	49	54	59	65

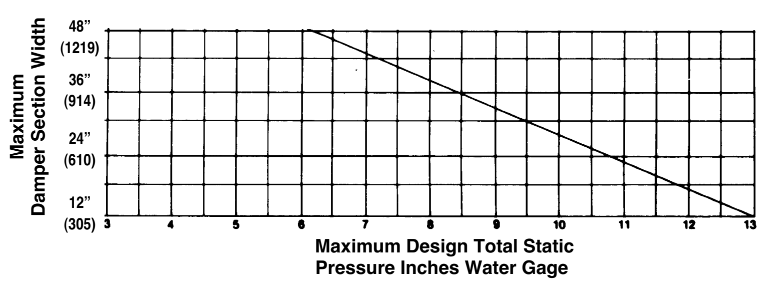
LEAKAGE CORRECTION FACTOR

DAMPER WIDTH (INCHES)	STATIC PRESSURE (Inches Water Gage)												
	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"	11"	12"	13"
12" (305)	1.0	1.5	1.8	2.1	2.4	2.6	2.8	2.8	2.8	2.9	2.9	3.2	3.7
24" (610)	1.0	1.5	1.8	2.1	2.4	2.6	2.8	2.8	2.8	2.9	2.9	3.2	3.7
36" (914)	1.0	1.5	1.8	2.1	2.4	2.6	2.8	2.8	2.8	2.9	2.9	3.2	3.7
48" (1219)	1.0	1.6	2.0	2.3	2.6	3.0	MAX. DESIGN PRESSURE 6.5						

To determine leakage at static pressure differentials higher than one inch water gage, multiply leakage at one inch (from upper table) by correction factor for higher static pressure and appropriate UNIT WIDTH (from lower table). Example: Find leakage for a 36"w x 24"h (914 x 610) damper at 3 inches w.g. 18 CFM x 1.8 = 32.4 CFM leakage at 3 inches w.g.

Leakage ratings are based on AMCA Standard 500 using Test Setup Apparatus Figure 5.5. Torque applied holding damper closed at 5 in. lbs. per sq. ft. of damper with minimum of 20 in. lbs.

4RAFBCD3 PRESSURE LIMITATIONS



The 4RAFBCD3 dampers may be used in systems with total pressures exceeding 6" w.g. by reducing damper section width as indicated. Example: Maximum design total pressure of 8.5" w.g. would require the 4RAFBCD3 damper with Maximum Section Width of 36" (914).

Pressure Limitations shown on chart above allow maximum blade deflection of 1/360 of span.