SUBMITTAL

Job Title: **Pistol River Bridge Containment Enclosure**

Job Site: Conway Construction
US101: Pistol River Bridge
Oregon Coast Highway
Curry County
Pistol River , OR 97444
United States

Date: 11/21/12

Submitted By: Bill Bone

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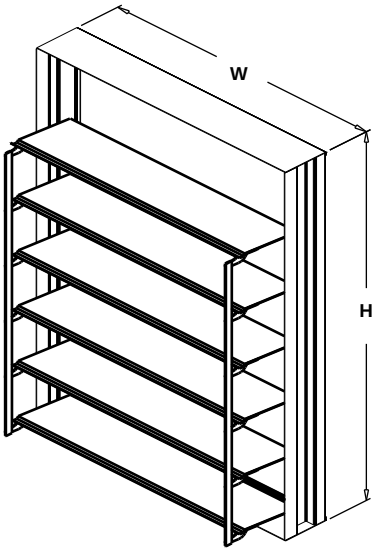
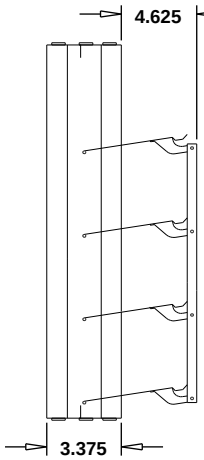




WD-400
Vertical Mount Intake Damper

Application & Design

The WD-400 damper is a vertical mount flangeless non-motorized flangeless backdraft damper for intake air. This damper is designed to prevent reverse airflow. The damper is opened by air pressure differential and closed by springs. Motor packs are not available.

RATINGS
Maximum Pressure: 2 in. wg
Maximum Velocity: 2,500 ft/min
Maximum Temperature: 180.0 F.

Installation instructions available at www.greenheck.com.

Selected Accessories
Finish: Hi-Pro Polyester Dark Gray (041)

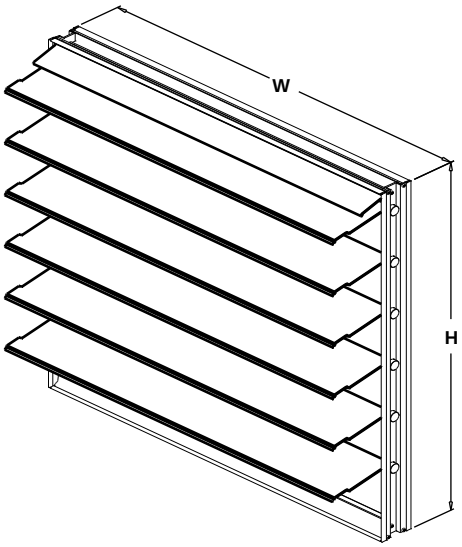
Notes: All dimensions shown are in units of inches.

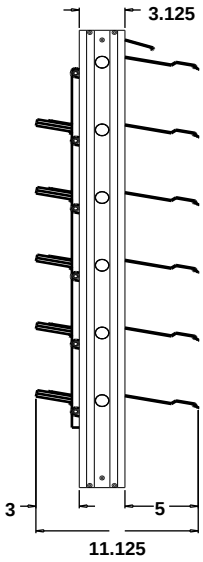
W & H furnished approximately 0.125 in. undersize.

CONSTRUCTION FEATURES

Frame Material:	Galvanized	**Axle Bearings:**	Synthetic
Axle Material:	304 SS	**Sizing:**	Nominal

ID #	Tag	Qty	W (in.)	H (in.)
1-1		4	40.000	18.000





EM-30
Vertical Mount Exhaust Damper

Application & Design

The EM-30 series is a vertical mount,flangeless, backdraft damper that is designed to allow horizontal (exhaust) airflow and prevent reverse airflow. This damper is opened by air pressure differential and closed by gravity.

RATINGS
Pressure: 4 in. wg - 10 in. wg
Velocity: 2,500 ft/min - 3,500 ft/min
Temperature: 180.0 F.

CONSTRUCTION
- Frame: Heavy gauge 6063T5 extruded aluminum 0.125 in. thickness.
- Blades: Heavy gauge 6063T5 extruded aluminum 0.07 in. thickness.
- Bearings: Synthetic (acetal) sleeve type.
- Linkage: 0.125 in. plated steel with integral counterbalance weights and nylon pivot bearings.
- Blade Seals: Vinyl.

Installation instructions available at www.greenheck.com.

Notes: All dimensions shown are in units of inches.

W & H furnished approximately 0.25 in. undersized and only refer to damper dimensions (sleeve thickness is not included).

CONSTRUCTION FEATURES

Linkage Material: 304 SS **Operation:** Counterbalance
Sizing: Nominal

Selected Accessories

Adjustable Pressure Control

Hi-Pro Polyester Dark Gray (041)

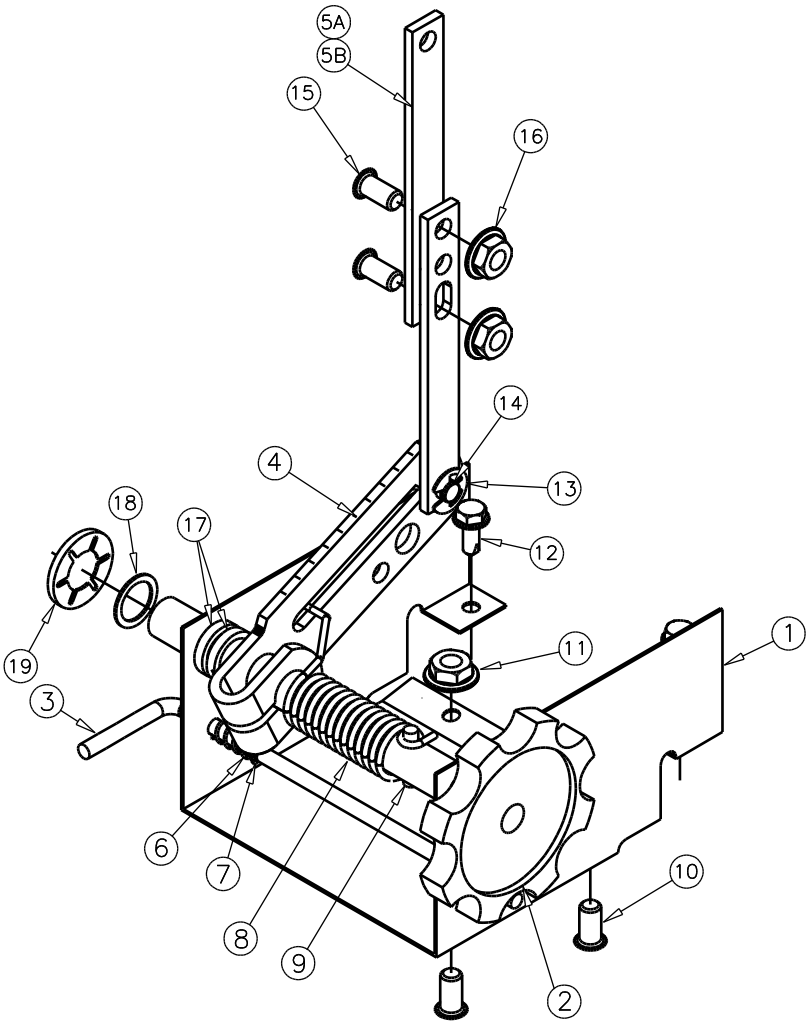
ID #	Tag	Qty	W (in.)	H (in.)	Sect. Wide	Sect. High
2-1		1	40.000	18.000	1	1

APC

Adjustable Pressure Controller

APC allows field setting of relief pressure on all EM dampers.

Item #	Part #	Description	QTY
1	705238	Mounting Bracket	1
2	823936	Control Knob Sub-Assembly	1
3	705241	Release Rod	1
4	653631	Non-Knurled Crankarm	1
5A	705239	Connecting Bar (4.125 in. long)	as
5B	705240	Connecting Bar (3.000 in. long)	req'd
6	457803	Spring	1
7	457806	3/16 E-Clip	1
8	453728	Link Separator Spring-SS	1
9	454092	5/32 x 1.5 Roll Pin-SS	2
10	416052	#10-32 x 5/8 SS Threadstud	2
11	415991	#10-32 Keps Nut-SS	2
12	415555	#10 x 1/2 Tek Screw-ZP	2
13	415588	1/4 in. E-Clip-ZP	1
14	451819	1/4 x 1/2 Knurl Pin-ZP	1
15	415609	1/4-20 x 1/2 Threadstud	2
16	415455	1/4-20 Spinlock Nut-ZP	2
17	415482	3/16 x 1/2 Nylon Washer	2
18	415483	1/2 x .030 Nylon Washer	1
19	415484	1/2 in. Push-On Retainer-ZP	1



Maximum recommended pressure set limitations are as follows:	
Area (ft/min)	**Max. Set Pressure (in. wg)**
4	0.75
6	0.50
8	0.40
10	0.30
15	0.20
20	0.15
24	0.125

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WD-400 SERIES

Non-Motorized Backdraft Damper
Horizontal or Vertical Mount (Intake)

Application and Design

The WD-400 series are non-motorized backdraft dampers which may be mounted either vertically for intake air or mounted horizontally to allow vertical airflow down and prevent reverse airflow. The dampers are opened by air pressure differential and closed by springs. Optional motor packs are not available.

Ratings (See page 2 for specific limitations)

Pressure: 2.0 in. wg (498 Pa) - differential
Velocity: 2500 fpm (13 m/s)
Temperature: 180°F (82ºC)

Standard Construction

Frame: 18 ga. (1.3mm) galvanized steel
Blades: 0.025 in. (0.64mm) aluminum
Axles: 3/16 in. (4.8mm) dia. zinc plated steel
Bearings: Synthetic (acetal)
Linkage: 0.064 in. (1.6mm) 6061T6 aluminum
Blade Seals: Vinyl

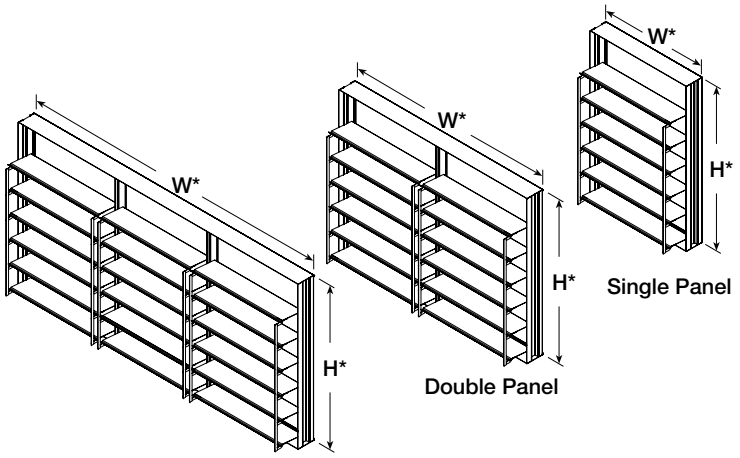
Size Limitations (see pages 3 & 4 for specific

Minimum Panel Size
8 in. W x 8 in. H
(203mm x 203mm)

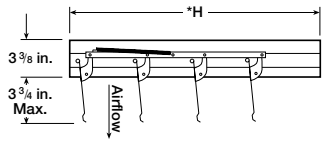
Maximum Panel Size
Single Panel: 31 in. W x 74 in. H
(787mm x 1880mm)
Double Panel (WD-400/410): 50 in. W x 74 in. H
(1270mm x 1880mm)
Double Panel (WD-420/430): 63 in. W x 74 in. H
(1600mm x 1880mm)
Triple Panel (WD-420/430): 74 in. W x 74 in. H
(1880mm x 1880mm)

Options and Accessories (at additional cost)

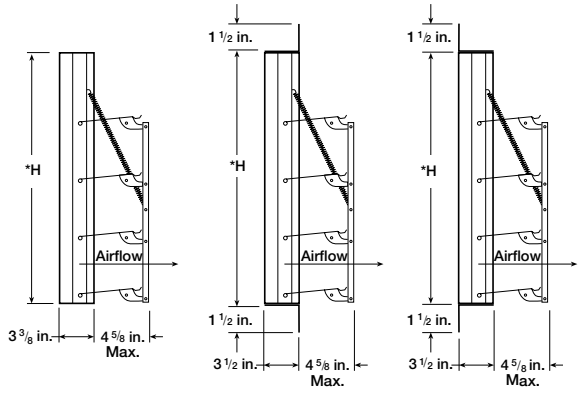
- 1½ in. (38mm) flange on discharge: WD-420
- 1½ in. (38mm) flange on intake: WD-430
- Stainless Steel Axles



*W & H dimensions furnished approximately 1/8 in. (3mm) under size.



Model WD-410
No Flange



Model WD-400
No Flange

Model WD-420
Flange on Discharge

Model WD-430
Flange on Intake

Pressure Drop

Performance data results from testing a 36 in. x 36 in. (914mm x 914mm) damper in accordance with AMCA Standard 500-D using Figure 5.3 for the WD-400 and Figure 5.7A for the WD-410. All data has been corrected to represent standard air at 0.075 lb/ft^3 (1.201 kg/m^3).

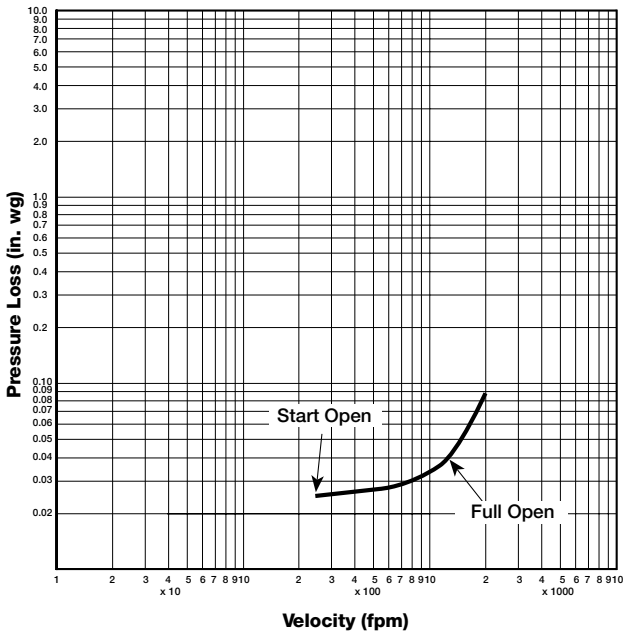
WD-400

Operational Data	ΔP in. wg (Pa)	Velocity fpm (m/s)
Blades Start to Open	0.026 (6.5)	250 (1.3)
Blades Fully Open	0.04 (10)	1200 (6.1)

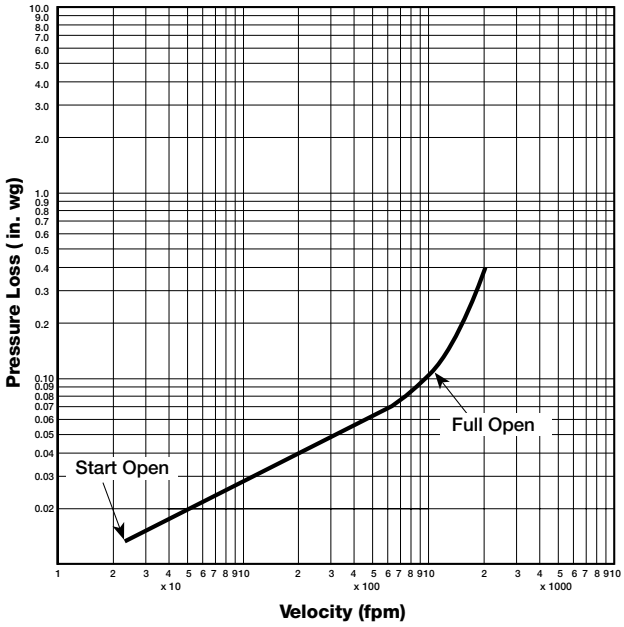
WD-410

Operational Data	ΔP in. wg (Pa)	Velocity fpm (m/s)
Blades Start to Open	0.014 (3.5)	22 (0.1)
Blades Fully Open	0.12 (30 Pa)	1000 (5.1)

Pressure Drop
36 in. x 36 in. (914mm x 914mm) Damper



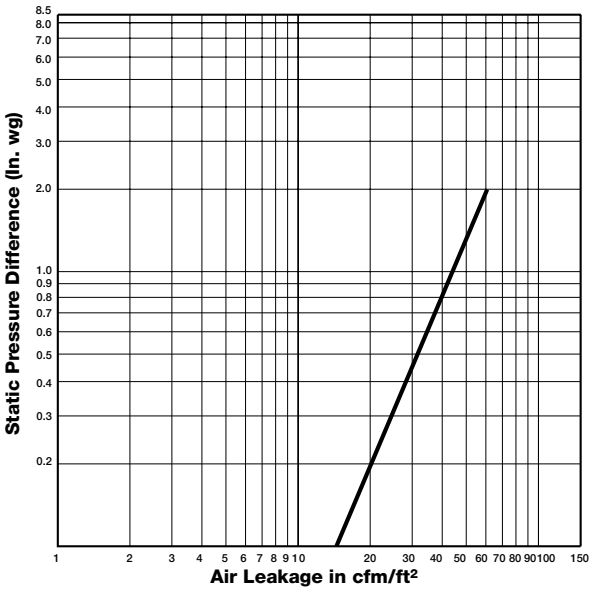
Pressure Drop
36 in. x 36 in. (914mmx 914mm) Damper



Leakage

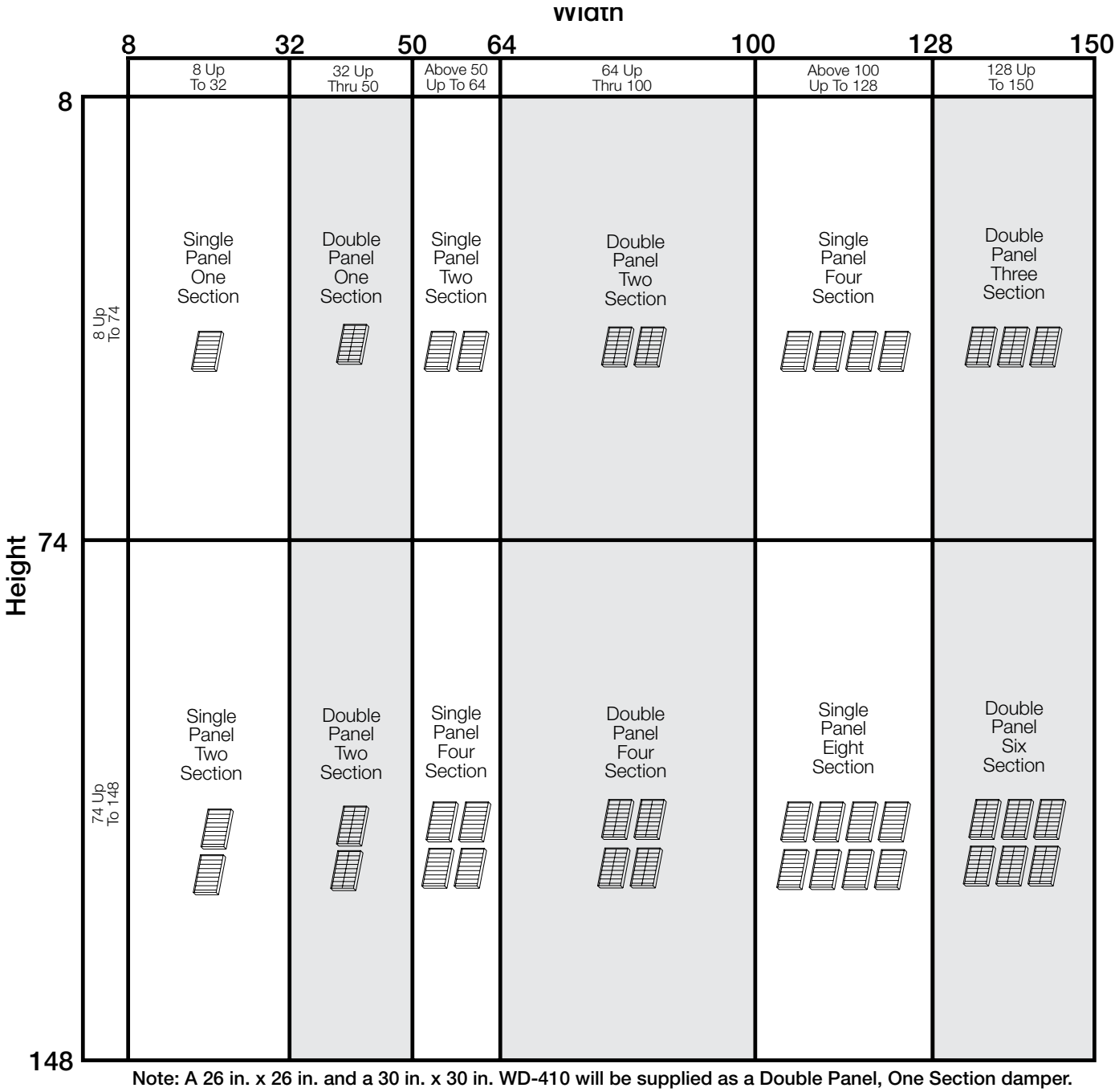
Leakage testing was conducted in accordance with AMCA Standard 500-D and is expressed as cfm/ft^2 of damper face area. All data has been corrected to represent standard air at 0.075 lb/ft^3 (1.201 kg/m^3).

Leakage
36 in. x 36 in. (914mm x 914mm) Damper



WD-400/410 SELECTION

- Multiple section dampers shown below are supplied as equal size sections. Any damper that has multiple sections, both vertically and horizontally, will require field assembly and <u>will</u> require additional reinforcement (not supplied by Greenheck) to support the assembly. These larger dampers <u>must</u> have the additional reinforcement to give them structural stability.
- Please note that the width dimension is **always** taken as being parallel to the length of the blades.



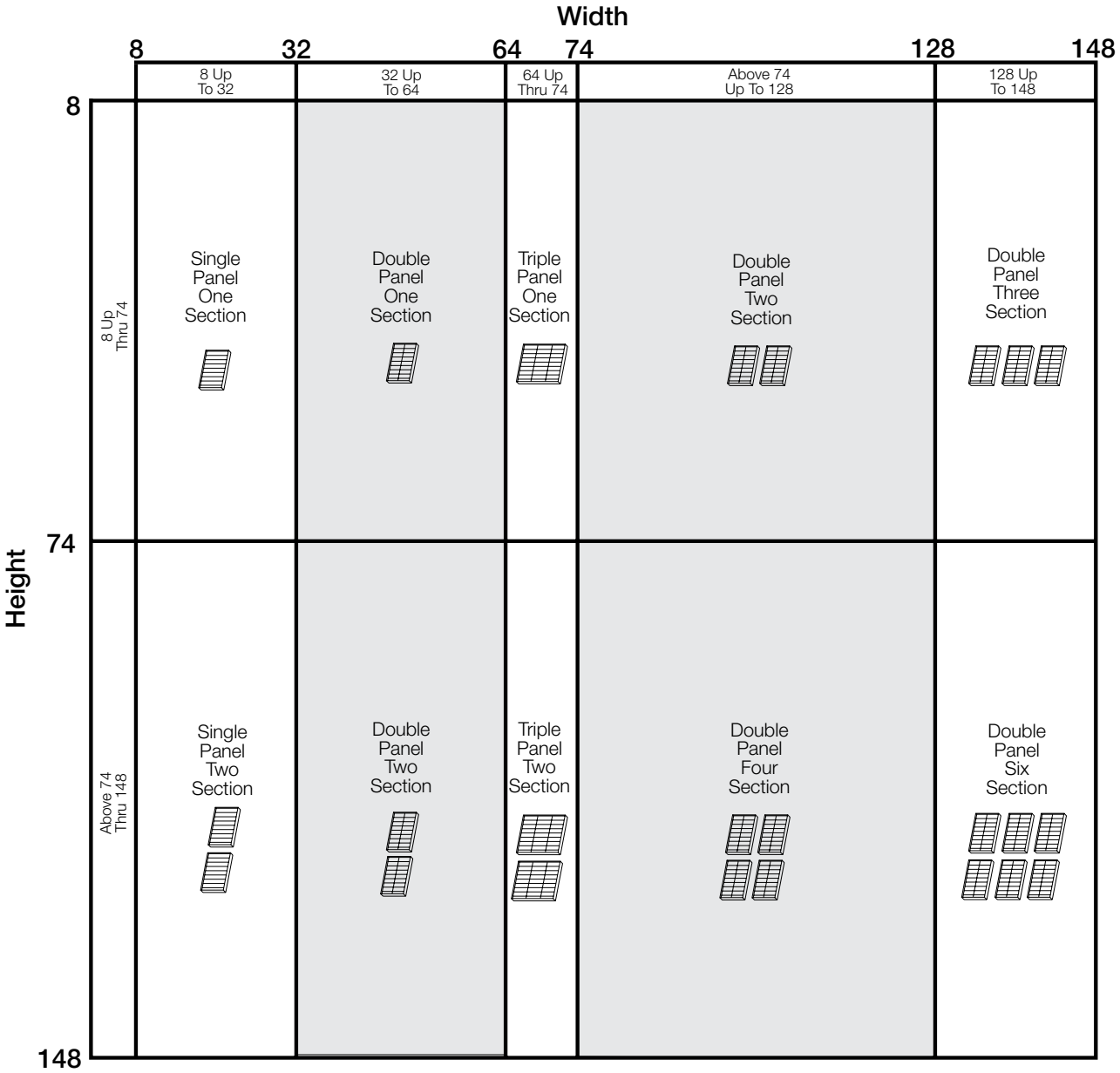
Note: A 26 in. x 26 in. and a 30 in. x 30 in. WD-410 will be supplied as a Double Panel, One Section damper.

*Width and height given in inches.

WD-420/430 SELECTION SPECIFICATIONS

- Multiple section dampers shown below are supplied as equal size sections. Any damper that has multiple sections, both vertically and horizontally, will require field assembly and <u>will</u> require additional reinforcement (not supplied by Greenheck) to support the assembly. These larger dampers <u>must</u> have the additional reinforcement to give them structural stability.

- Please note that the width dimension is **always** taken as being parallel to the length of the blades.



*Width and height given in inches.

Specifications

Backdraft dampers meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules. Dampers shall consist of: 18 ga. (1.3mm) galvanized steel frame with 3 ½ in. (89mm) depth; blades from 0.025 in. (.64mm) roll-formed aluminum; 3/16 in. (4.8mm) dia. plated steel, full length axles turning in acetal bearings; damper shall be equipped with extruded vinyl blade seals; and internal 0.064 in. (1.6mm) aluminum tie bar (on-blade) with spring closure. Damper manufacturer's printed application and performance data including pressure, velocity and temperature limitations shall be submitted for approval showing damper suitable for pressures to 2.0 in. wg (498 Pa), velocities to 2500 fpm (13m/s) and temperatures to 180°F (82ºC). Testing and ratings to be in accordance with AMCA Standard 500-D. Basis of design is Greenheck model WD-400.

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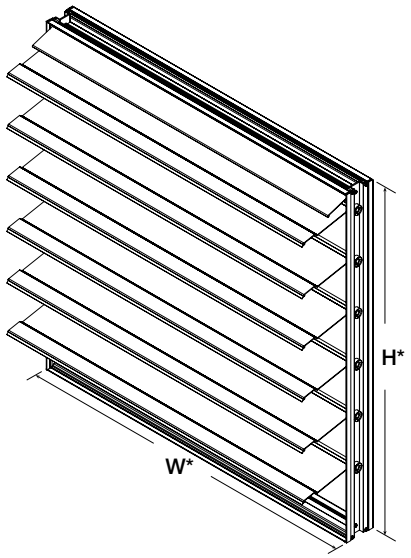
Extruded BACKDRAFT DAMPER

EM-30 SERIES
Vertical Mount - Horizontal Airflow

Application and Design

The EM-30 series is a vertical mounted backdraft damper that is designed to allow horizontal airflow and prevent reverse airflow. The damper is opened by air pressure differential and closed by gravity.



*W & H dimensions furnished approximately 1/4 in. (6mm) under size.

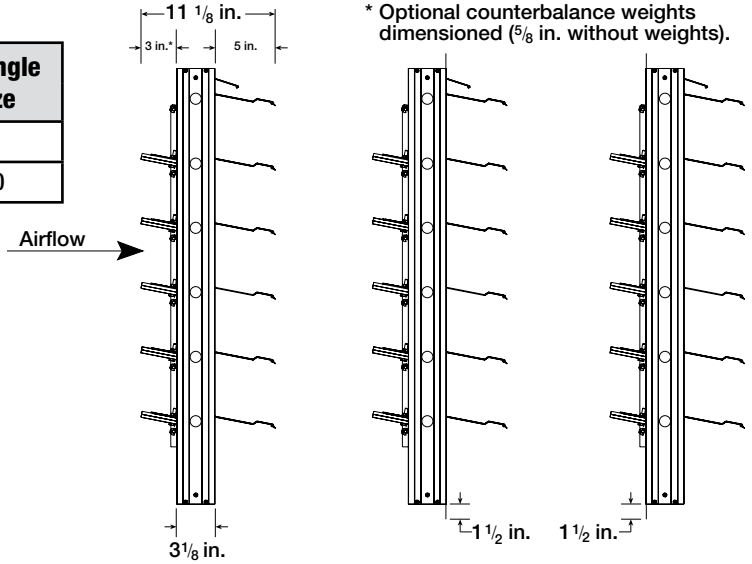
Ratings (See page 2 for specific limitations)

Pressure: 4.0 - 10.0 in. wg (996 Pa- 2491 Pa) differential pressure.
Velocity: 2500 to 3500 fpm (13 m/s - 18 m/s)
Temperature: 180°F (82°C)

	Standard
Frame Material	6063T5 Extruded Aluminum
Frame Thickness	.125 in. (3.2mm)
Blade Material	6063T5 Extruded Aluminum
Blade Thickness	.070 in. (1.8mm)
Axle	3/4 in. (19mm) metallic
Axle Linkage	1/8 in. (3mm) plated steel
Bearings	Synthetic (acetal) sleeve type
Blade Seals	Vinyl

W x H	Minimum Size		Maximum Single Section Size
	With Weights	Without Weights	
Inches	8 x 11	8 x 8	48 x 74
mm	203 x 279	203 x 203	1219 x 1880

Sizes larger than maximum shown will be supplied as two or more equal size smaller dampers required to make up the size specified. These larger multiple damper assemblies require field assembly and may require additional reinforcement (not supplied by Greenheck) to support the assembly.



Options and Accessories

- Counterbalance Weights
- 1½ in. (38mm) flange on discharge: EM-31
- 1½ in. (38mm) flange on intake: EM-22
- APC (Adjustable Pressure Controller). Allows field setting of relief pressure on all EM dampers. Use one per panel. Maximum recommended pressure set limitations are as follows:

Area ft^2 (m^2)	Maximum Set Pressure in. wg (Pa)
4 (.37)	.75 (187)
6 (.56)	.50 (125)
8 (100)	.40 (100)
10 (.93)	.30 (75)
15 (1.39)	.20 (50)
20 (1.86)	.15 (37)
24 (2.23)	.125 (31)

Counterbalance weights may require field adjustment. Instructions are available at www. greenheck.com.

Performance Data

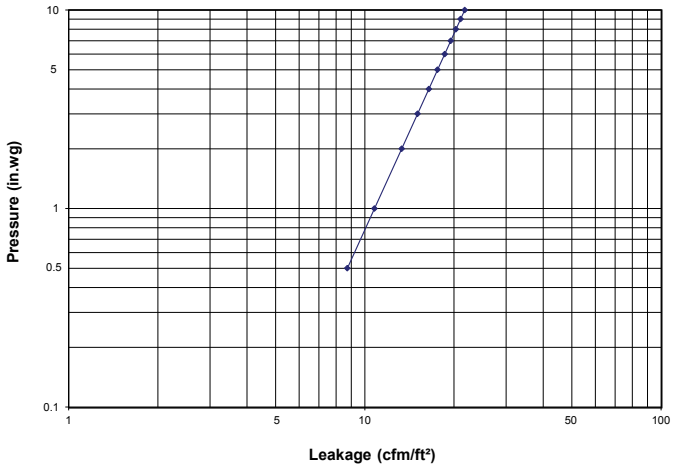
EM-30

Performance data results from testing a 36 in. x 36 in. (914mm x 914mm) damper in accordance with AMCA Standard 500-D using Figure 5.3 and Figure 5.5. All data has been corrected to represent standard air at 0.075 lb/ft^3 (1.201 kg/m^3).

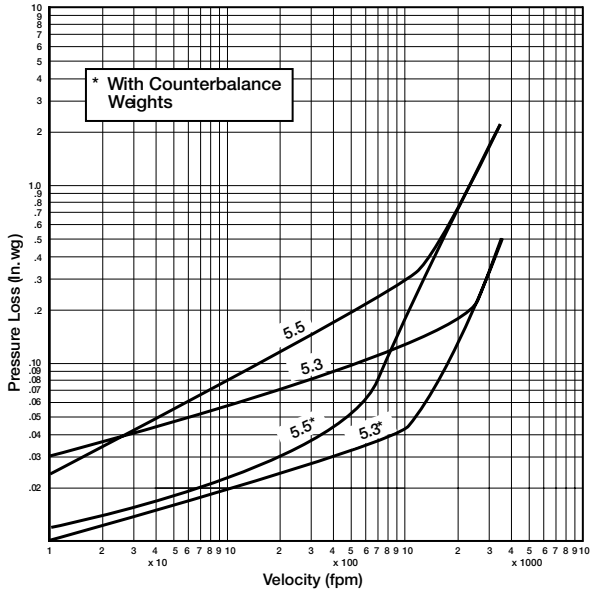
Operational Data			ΔP in. wg (Pa)	Velocity fpm (m/s)
Figure 5.3	Without Weight	Blades Start to Open	0.03 (7.5)	10 (.05)
		Blades Fully Open	0.25 (62)	2500 (12.7)
	With Weights	Blades Start to Open	0.01 (2.5)	10 (.05)
		Blades Fully Open	0.055 (13.7)	1200 (6.1)
Figure 5.5	Without Weights	Blades Start to Open	0.025 (6.2)	10 (.05)
		Blades Fully Open	0.32 (8)	1200 (6.1)
	With Weights	Blades Start to Open	0.012 (3)	10 (.05)
		Blades Fully Open	0.08 (20)	700 (3.6)

Leakage testing was conducted in accordance with AMCA Standard 500D and is expressed as CFM per sq. ft. of damper face area. All data has been corrected to represent standard air at 0.075 lb/ft^3 (1.201 kg/m^3).

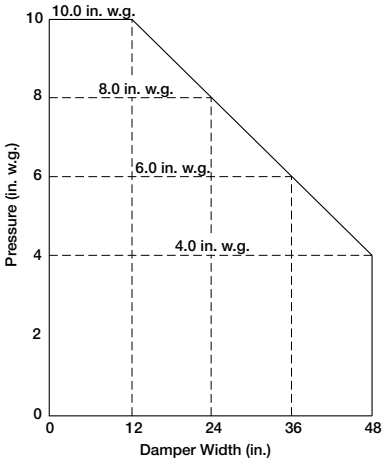
36 in. x 36 in. Damper



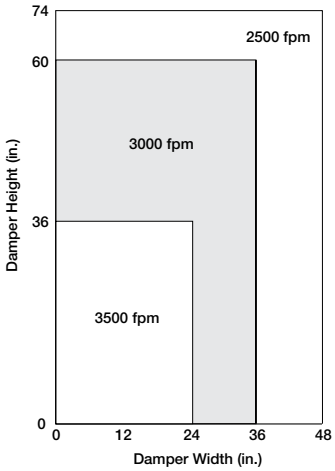
Pressure Drop



Pressure Limitations



Velocity Limitations



Specifications

Backdraft dampers meeting the following specifications shall be furnished and installed where shown on plans and/or as described in schedules. Dampers shall consist of: heavy gauge 6063T5 extruded aluminum channel frame (0.125 in. [3.2mm] thick) with 3 1/8 in. (79mm) depth; blades from 0.070 in. (1.8mm) 6063T5 extruded aluminum; 3/4 in. (19mm) dia. metallic axles turning in acetal bearings; damper shall be equipped with extruded vinyl blade seals; and internal 1/8 in. (3mm) plated steel blade-to-blade linkage. Damper manufacturer's printed application and performance data including pressure, velocity and temperature limitations shall be submitted for approval showing damper suitable for pressures to 10 in. wg (2491 Pa), velocities to 3500 fpm (18m/s) and temperatures to 180°F (82ºC). Testing and ratings to be in accordance with AMCA Standard 500-D. Basis of design is Greenheck model EM-30.

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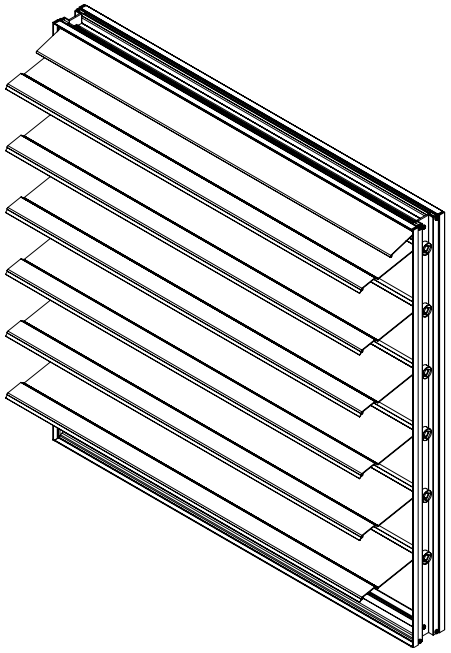
ES, EM & GM series
Part number 468391

Installation, Operation, and Maintenance Instructions

This manual is the property of the owner, and is required for future maintenance. Please leave it with the owner when the job is complete.



RECEIVING AND HANDLING

Upon receiving dampers, check for both obvious and hidden damage. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier. Check to be sure that all parts of the shipment, including accessories, are accounted for.

Dampers must be kept dry and clean. Indoor storage and protection from dirt, dust and the weather is highly recommended. Do not store at temperatures in excess of 100°F(37°C).

SAFETY WARNING:

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.

Due to continuing research, Greenheck reserves the right to change specifications without notice.

Pre-Installation Guidelines

The basic intent of a proper installation is to secure the damper into the opening in such a manner as to prevent distortion and disruption of damper operation. The following items will aid in completing the damper installation in a timely and effective manner.

1) Check the schedules for proper damper locations within the building. Visually inspect the damper for damage.
2) Lift or handle damper using sleeve or frame. Do not lift damper using blades or linkage. When handling multiple sections assemblies, use sufficient support to evenly lift at each section mullion (see drawing). Do not drag, step on, apply excessive bending, twisting, or racking. (See Figure 1)
3) Do not install screws in damper frame that will interfere with damper blades and prevent them from opening and/or closing.

Pre-Installation Guidelines continued...

4) Damper must be installed into duct or opening square and free of twist or other misalignment. Damper must not be squeezed or stretched into duct or opening. Out of square, racked, twisted or misaligned installations can cause excessive leakage and/or torque requirements to exceed damper/actuator design.
5) Damper must be kept clean, dry and protected from dirt, dust and other foreign materials prior to and after installation. Examples of such foreign materials include but are not limited to:
    a) Drywall/mortar dust
    b) Firesafing materials
    c) Wall texture
    d) Paint overspray
6) Damper should be sufficiently covered as to prevent overspray if wall texturing or spray painting will be performed within 5 feet (1.50m) of the damper. Excessive dirt or foreign material deposits on damper can cause excessive leakage and/or torque requirements to exceed damper/actuator design.

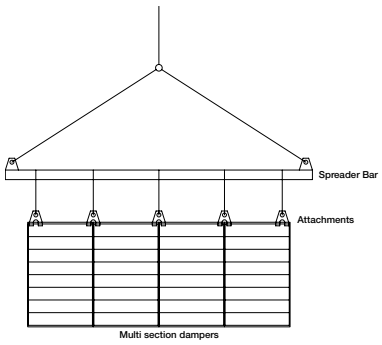


Figure 1

7) ACCESS: Suitable access (actuators maintenance, etc.) must be provided for damper inspection and servicing. Where it is not possible to achieve sufficient size access, it will be necessary to install a removable section of duct.

EM/ES/GM Damper Counterbalance Adjustment Procedure

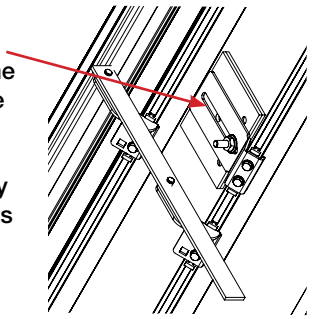
The following instructions should be followed when attempting to maximize the counterbalance effect on the EM or GM model dampers. Be aware that when the balance setting is highly sensitive, friction wear and contamination will have an adverse effect to the operation of the damper. The sensitivity of the counterbalance should only be set to meet the application requirements. The damper must be mounted square and plumb and operate freely before any weight adjustments are performed.

Counterbalance adjustment for EM/ES/GM-30, 31 & 32 Models: Vertical Mount – Horizontal Airflow

Adjustment #1 will effect the balance of the blades in the open position. Adjustment #2 will effect the balance of the blades in the closed position along with a small change to the open position balance.

If the damper blades do not achieve full open position under airflow and you want them to open further or all the way, then adjustment #1 will need to be performed. If the damper blades do not open completely and adjustment #1 has been addressed, then more weight is required.

If the airflow through the damper is light and the blades only slightly move from the closed position, then adjustment #2 and #1 are required.

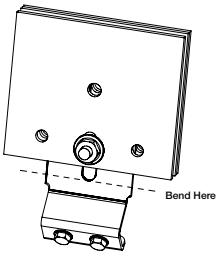


Adjustment #1:

Moving the weight stack along the length of the mounting bracket slot will effect the full open balance of the blade assembly. Moving the weights further away from the blade pivot point will cause the blades to become more balanced so that at some point, and with enough weight, the blades would remain open. Care must be taken to ensure that when the weights are moved outward from the blade pivot point they will not interfere with the adjacent blade when the blades close. Moving the weights back towards the blade pivot point will allow the blades to close.

Adjustment #2:

The damper is assembled with the counterbalance weights and bracket installed such that, when the blades are closed, the counterbalance weights and bracket are positioned directly inline with the blade pivot points. This position of the weights will provide a slight load that will hold the blades in the closed position. To reduce this load, the counterweight-mounting brackets can be bent away from the adjacent blade surface. Bending the counterweight mounting brackets will move the counterweight stack behind the blade pivot point and therefore allow the blades to start opening at lower airflow rates. This adjustment should be performed in small increments since the blades will not fully close if the brackets are bent to far. Performing adjustment #2 will have a small effect on adjustment #1 therefore, if adjustment #1 is critical, then adjustment #1 may need to be repeated.

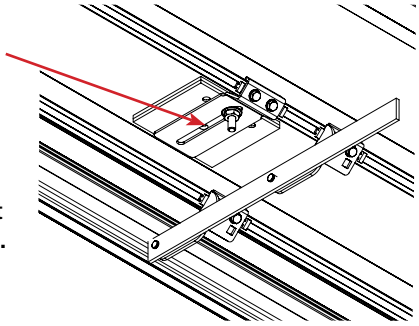


Counterbalance Adjustment for EM/ES-10, 11 & 12 Models: Horizontal Mount - Vertical Airflow Up

Adjustment #1 will effect the balance of the blades in the closed position. Adjustment #2 will effect the balance of the blades in the open position along with a small change to the balance in the closed position balance.

If the damper blades are partially opening under airflow and you want them to open further or all the way, then adjustment #1 will need to be performed. If the blades remain in the full open position then adjustment #2 is required.

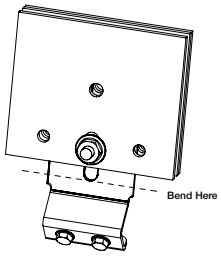
If the airflow through the damper is light and the blades only slightly move from the closed position, then adjustment #1 is required. If the airflow through the damper is light and the blades do not reach full open position then adjustment #2 may be excessive or adjustment #1 may need to be increased or both adjustments may need to be addressed.



Adjustment #1:

Moving the weight stack along the length of the mounting bracket slot will effect the full closed balance of the blade assembly. Moving the weights further away from the blade pivot point will cause the blades to become more balanced so that at some point, and with enough weight, the blades would remain open without air pressure being applied. Care must be taken to ensure that when the weights are moved away from the blade pivot point the weights will not interfere with the adjacent blade when the blades close. Moving some of the weights back towards the blade pivot point will allow the blades to return to the closed position.

Adjustment #2:



The damper is factory assembled with the counterbalance assembly installed such that, the counterbalance weights and bracket are positioned at a slight angle to the surface of the blade. This angle will position the weights such that they will provide a slight load that will cause the blades to rotate from the full open position toward the closed position. If for some reason the blades remain in the open position then you will need to increase this load. To do this the counterweight-mounting brackets should be bent further away from the blade surface. Bending the counterweight mounting brackets will move the counterweight stack away from the blade surface and therefore the torsion effect will force the blades to start closing. This adjustment should be performed in small increments to each weight bracket. Performing adjustment #2 will have a small effect on adjustment #1 therefore, if adjustment #1 is critical, then adjustment #1 may need to be repeated.

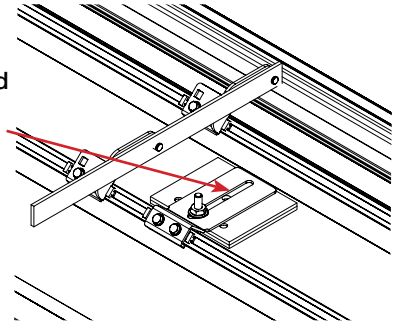
Counterbalance Adjustment for EM/ES-40, 41 & 42: Horizontal Mount – Vertical Airflow Down

Adjustment #1 will effect the balance of the blades in the closed position. Adjustment #2 will effect the balance of the blades in the open position along with a small change to the balance in the closed position.

If the damper blades are only opening partially under airflow and you want them to open further or all the way, then adjustment #1 will need to be performed. If the damper blades do not close completely and adjustment #1 has been addressed, then more weight is required. If the blades remain in the full open position then adjustment #2 is required.

If the airflow through the damper is light and the blades only slightly move from the closed position, then adjustment #1 is required.

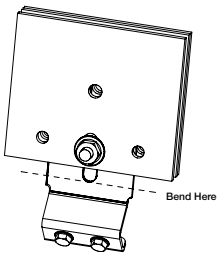
Adjustment #1:



Moving the weight stack along the length of the mounting bracket slot will effect the full closed balance of the blade assembly. Moving the weights closer to the blade pivot point will cause the blades to become less balanced so that at some point, the blades would fall open. Care must be taken to ensure that when the weights are moved outward from the blade pivot point the weights will not interfere with the adjacent blade when the blades close. Moving the weights away from the blade pivot point will force the blades to close properly. Care must be taken to ensure that when the weights are moved outward from the blade pivot point the weights will not interfere with the adjacent blade when the blades close. Performing adjustment #1 will have a small effect on adjustment #2 therefore, if adjustment #2 is critical, then adjustment #2 may need to be repeated.

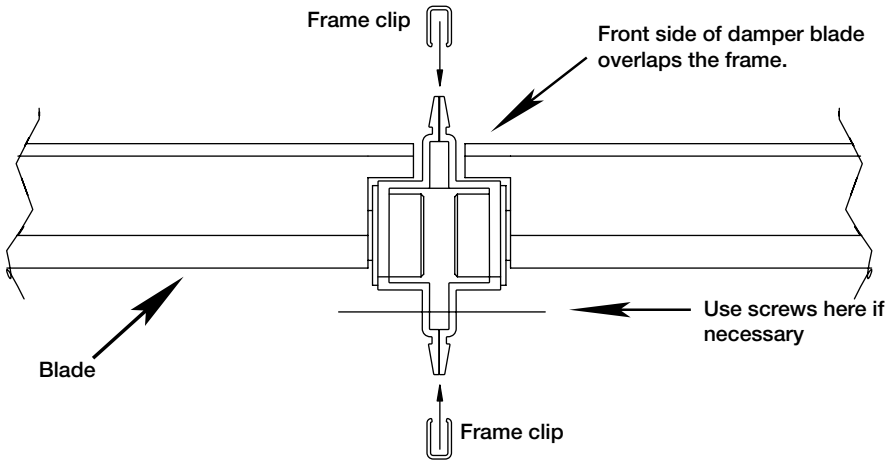
Adjustment #2:

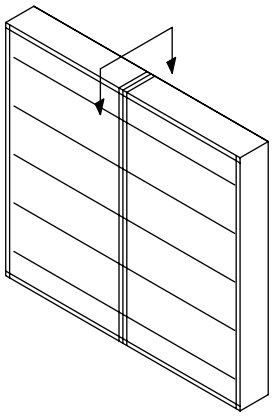
The damper is factory assembled with the counterbalance weights and bracket installed such that, when the blades are closed, the counterbalance weights and bracket are positioned directly inline or slightly ahead of the blade pivot points. The position of the weights will provide a slight load that will cause the blades to rotate from the full open position toward the closed position. To increase this load, the counterweight-mounting brackets can be bent toward the adjacent blade surface. Bending the counterweight mounting brackets will move the counterweight stack which will force the blades to start closing. This adjustment should be performed in small increments to each weight bracket since bending the brackets two much will cause the weight stack to interfere with the adjacent blade surface. Performing adjustment #2 will have a small effect on adjustment #1 therefore, if adjustment #1 is critical, then adjustment #1 may need to be repeated.



Multi-section Assembly

When the finished damper assembly is made up of multiple sections, the sections will require field assembly. Frame clips are provided for this purpose. The frame clips are a snap fit component that fit over the joint between adjoining sections. The clips will require the use of a rubber hammer or similar tool to install as shown below. Install frame clips on the front side and backside of the assembly. For added strength, screws may be used on the backside of the frames in lieu of or in addition to the frame clip. Do not install screws on the front side of the frame where they could interfere with the operation of the blades.





Vertical joint shown. Horizontal joint is similar.