

Installation, Operation and Maintenance Manuals

Job Title: **ICON - Webster Univ - ISB**

Job Site: Webster University
 547 Garden Ave

Saint Louis, MO 63119
United States

Customer PO#: Webster ISB 5768

Contractor: ICON MECHANICAL

Elevation: (ft) 709

Date: 1/25/2017

Submitted By: Mark Haas

Agent Order#: 1610111B

H C SHARP COMPANY INC
8301D CREST INDUSTRIAL DRIVE
SAINT LOUIS, MO 63123
US

Phone: 3143516900

Fax: 13143516901

Email Address: karen@hcsharpco.com



P.O. Box 410 Schofield, WI 54476 (715) 359-6171 FAX (715) 355-2399 www.greenheck.com

Product IOMs

Mark Name	Model Name
MODs 10-10-2016 Actuator Int., MODs 10-10-2016 Actuator Ext.	VCD-23

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).

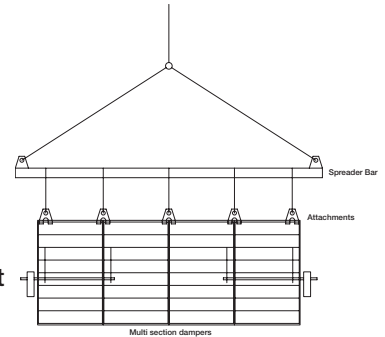
SAFETY WARNING:

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.

PRE-INSTALLATION GUIDELINES

The basic intent of a proper installation is to secure the volume control 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, linkage, actuators, or jackshafting. 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.
- 3) Do not install screws in damper frame that will interfere with unexposed blade linkage and prevent damper blades from opening and/or closing.
- 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 and actuator 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) Mortar dust
 - b) Drywall dust
 - c) Firesafing materials
 - d) Wall texture
 - e) 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.
- 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.



ELECTRICAL GUIDELINES

Electrical and/or pneumatic connections to damper actuators should be made in accordance with wiring and piping diagrams developed in compliance with applicable codes, ordinances and regulations.

SAFETY CAUTION!

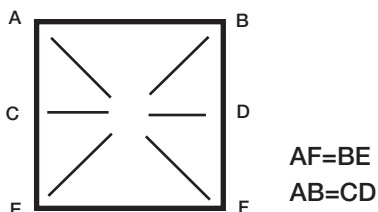
Verify power requirements before wiring actuator. Greenheck is not responsible for any damper to, or failure of the unit caused by incorrect field wiring.

SAFETY DANGER!

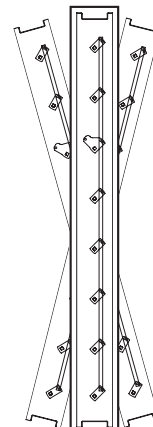
Electrical input may be needed for this equipment. This work should be performed by a qualified electrician.

INSTALLATION - FAILURE TO FOLLOW INSTRUCTIONS WILL VOID ALL WARRANTIES

1. Duct opening or opening square should be measured 1/4 inch (6mm) larger than damper dimension and should be straight and level.

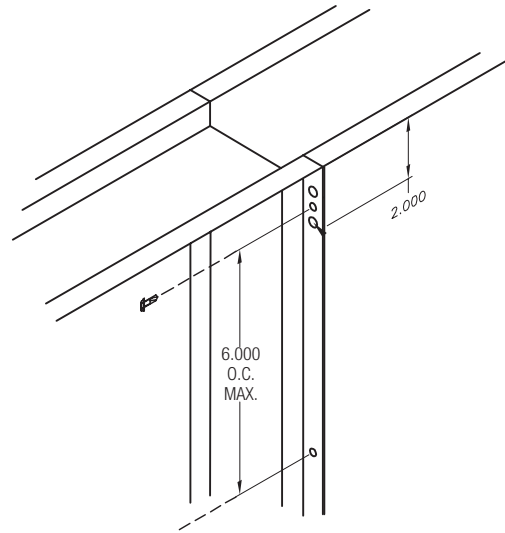
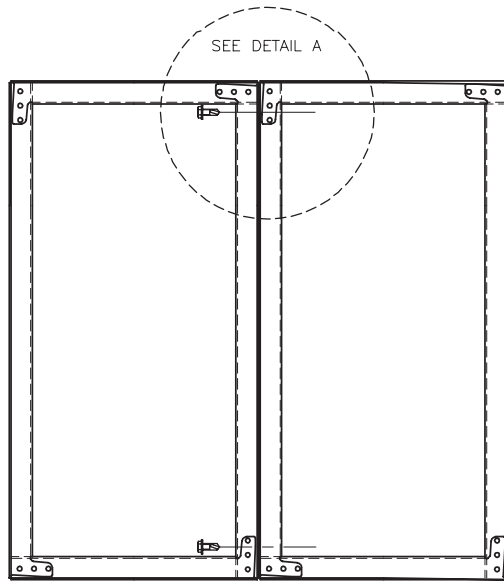


Do not twist or bow. Mount damper plumb in the opening.



INSTALLATION CONTINUED....

2. If more than two sections wide, unit ships as a multiple section assembly and a single section together. The single section is joined to the side of the multiple section where the jackshaft extends past the frame four inches (102mm).

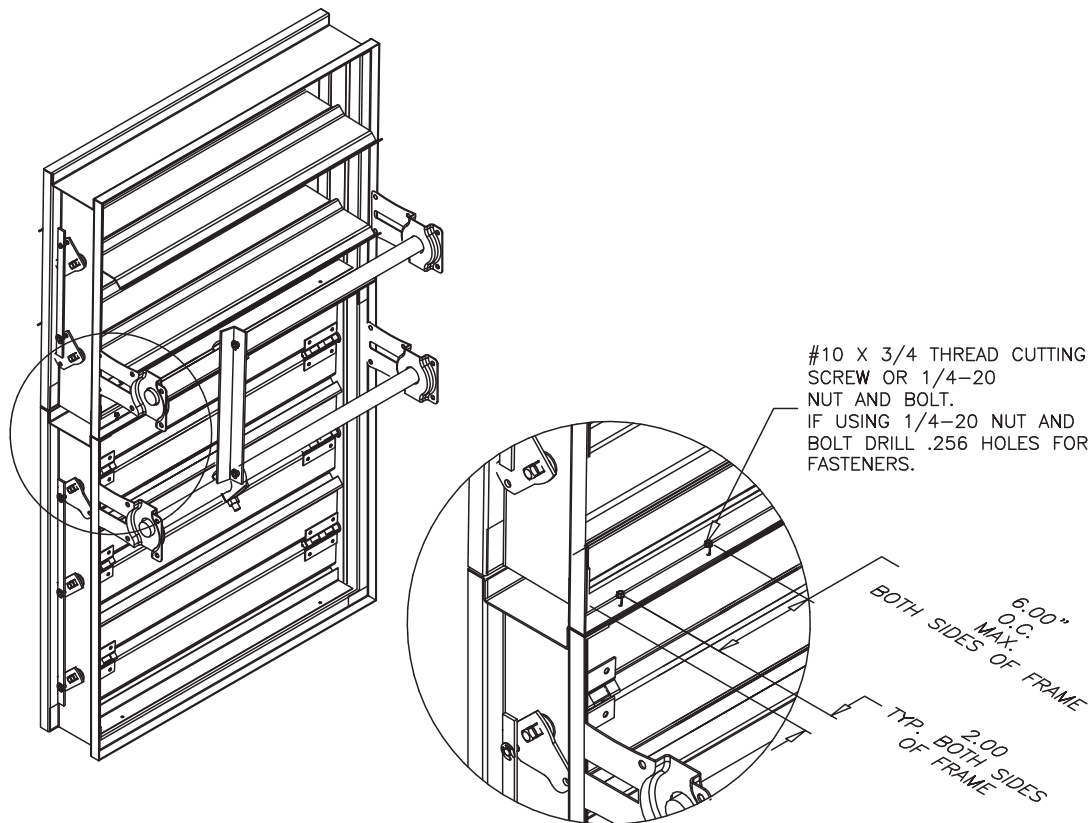


3. A damper assembly is not restricted to a maximum number of sections but, the assembly must not exceed the section sizes and overall sizes (see table below).

Damper Model	Maximum Single Section Size W x H in. (mm)	Maximum Overall Size for Multi-Section Dampers
VCD-20, VCD-23	48 x 74 (1219 x 1880)	Unlimited
VCD-33, VCD-34, VCD-40, VCD-42, VCD-43	60 x 74 (1524 x 1880)	Unlimited
VCD-20V, VCD-23V	74 x 48 (1879 x 1219)	NA
VCD-33V, VCD-42V, VCD-43V	74 x 60 (1879 x 1524)	NA
FBH-33 FBH-43	Face: 60 x 74 (1524 x 1880) Bypass: 60 x 74 (1524 x 1880)	Face: 96 x 74 (2438 x 1880)
FBV-33 FBV-43	Face: 60 x 74 (1524 x 1880) Bypass: 60 x 74 (1524 x 1880)	Face: 96 x 74 (2438 x 1880) Bypass: 96 x 74 (2438 x 1880)
FBH-23	Face: 48 x 74 (1219 x 1880) Bypass: 48 x 74 (1219 x 1880)	Face: 96 x 74 (2438 x 1880)
FBV-23	Face: 48 x 74 (1219 x 1880) Bypass: 48 x 74 (1219 x 1880)	Face: 96 x 74 (2438 x 1880) Bypass: 96 x 74 (2438 x 1880)

INSTALLATION (CONTINUED)....

4. The damper sections must be attached together with #10 x 3/4 in. (19mm) max. sheet metal screws, 1/4 in. (6mm) diameter nuts and bolts, tack or spot welds, or 3/16 in. (4mm) diameter steel pop rivets. Attachments must be spaced a maximum of 6 in. (152mm) on centers and a maximum of 2 in. (51mm) from corners. Attachments must be made on front face and back face (air entering and air exiting side) of damper sections.
5. Two section high dampers require reinforcement using a 14 gauge (2mm), 5 in. (127mm) wide mullion or two individually sleeved units stacked vertically. When using two individually sleeved units, the sleeve acts as the mullion, therefore no mullion is required (mullions are not provided by Greenheck).
6. When the height of a face & bypass vertical style (FBV) is greater than 84 in. (2134mm), the damper sections are shipped separate and field assembly is required. Before fastening damper sections together, the non-actuated damper section will need to be flipped upside down so that the linkage is on the same side as the actuated damper. After damper sections are fastened together, attach interconnecting angle as shown.



FRAME FASTENING DETAIL

7. If no holes are present in the frame, drill 1/4 inch (6mm) diameter holes at six inch (52mm) centers and fasten frames together with 1/4 inch (6mm) #20 (.03mm) bolts and nuts (see installation #2).
8. Use shims between damper frame and duct opening or opening space to prevent distortion of frame by fasteners holding it in place. Brace at every horizontal mullion and vertically brace at every eight feet (2.4m) of damper width for strength. Dampers in high velocity (2000 fpm [610mm] per second) may require more bracing.
Note: Greenheck dampers are specifically designed and engineered for structural integrity based on model and conditions. Attachment, framing, mating flanges, and anchoring of damper assemblies into openings, ductwork, or walls is the responsibility of the installer. Design calculation for these retaining and supporting members should be determined by field engineers for that particular installation.
9. If the damper actuator is to be mounted out of the airstream, the extension pin should extend approximately six inches (152mm) beyond the frame. On jackshafted units, the jackshaft should extend through the jackshaft bearing assembly approximately six inches (152mm) beyond the frame.
10. Individual damper sections, as well as entire multiple section assemblies must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each section.
11. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle dampers after installation to assure proper operation. On multiple section assemblies, all sections should open and close simultaneously.

Note: When you have a vertical damper installation, blades must be horizontal. When blades need to be vertical, you need a vertical blade damper (example: VCD-23V). These dampers are built so they don't crush the jamb seal.

DAMPER MAINTENANCE

Greenheck's dampers are designed to be trouble free and hassle free under normal operation. Dampers are to be installed square and straight so as to prevent binding during operation. The following annual damper maintenance suggestions will help to insure proper damper operation and increase the life expectancy of the damper.

- Foreign Matter** Over the course of time, dirt and grime may collect on damper surfaces. The damper surfaces should be cleaned to prevent hindrance to airflow.
- Moving Parts** Make sure that parts such as linkage, bearings, blades, etc. that are intended to move freely, can do so. Lubricating these components can prevent possible rusting and unnecessary friction increase. Use only a moli-spray oil or similar graphite based oil as regular lubricating oil will attract dirt.
- Closure** Bearings. Synthetic, oil impregnated, and ball bearings (without grease fittings) do not require lubrication. Ball bearings with grease fittings require only minimal grease.
- Operation** Remove foreign materials that may be interfering with blade closure or effective sealing of the blades with each other or with the frame.
- While operating the damper through its full cycle, check to see that the blades open and close properly. If there is a problem, check for loose linkage, especially at the actuator. Tighten the linkage where required.

DAMPER TROUBLESHOOTING

The following is a cause and correction list for common concerns with the dampers.

Symptom	Possible Cause	Corrective Action
Damper does not fully open and/or fully close	Frame is 'racked' causing blades to bind on jamb seals	Adjust frame such that it is square and plumb
	Actuator linkage loose	Close damper, disconnect power, adjust and tighten linkage
	Defective motor	Replace
	Screws in damper linkage	Locate screws and remove
	Actuator linkage hitting wall or floor	Damper installed too far into wall. Move out to line designated on damper label
	Contaminants on damper	Clean with a non oil-based solvent (see Damper Maintenance)
Actuator runs hot or makes a humming noise	Actuator prohibited from reaching end of stroke	Disconnect linkage from jackshaft, open damper, power actuator to end of spring, tighten linkage. Verify amp draw



Our Commitment

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Specific Greenheck product warranties are located on greenheck.com within the product area tabs and in the Library under Warranties.



Phone: (715) 359-6171 • Fax: (715) 355-2399 • E-mail: gfcinfo@greenheck.com • Website: www.greenheck.com

Installation, Operation and Maintenance Manuals

Job Title: **ICON - Webster Univ - ISB**

Job Site: Webster University
 547 Garden Ave

Saint Louis, MO 63119
United States

Customer PO#: Webster ISB 5768

Contractor: ICON MECHANICAL

Elevation: (ft) 709

Date: 1/25/2017

Submitted By: Mark Haas

Agent Order#: 1610111B

H C SHARP COMPANY INC
8301D CREST INDUSTRIAL DRIVE
SAINT LOUIS, MO 63123
US

Phone: 3143516900

Fax: 13143516901

Email Address: karen@hcsharpco.com



P.O. Box 410 Schofield, WI 54476 (715) 359-6171 FAX (715) 355-2399 www.greenheck.com

Product IOMs

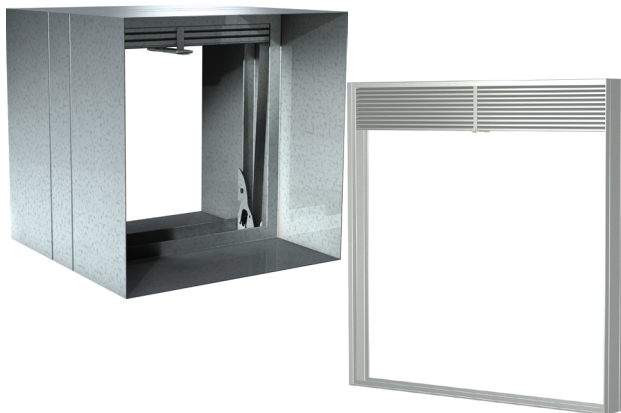
Mark Name	Model Name
FD R 11-30-2016, FD 11-30-2016	DFD-150
FSD 11-30-2016	FSD-211
FSD R 11-30-2016	FSDR-511

Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage!

These instructions apply to 1½ and 3 hour rated fire dampers mounted (blades must be horizontal) in: 1) masonry, block, or stud walls and 2) concrete floors. Specific requirements in these instructions are mandatory. Dampers must be installed in accordance with these instructions to meet the requirements of UL 555.

Note: Fire dampers are manufactured and labeled for either vertical or horizontal installation. The dampers must be installed in accordance with labeling.



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 (38°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.

Table of Contents

General Information	2
Pre-Installation Guidelines	2
Installation	3-12
• Preparation of Openings	3
• Clearances Required Between Damper Sleeves & Wall/Floor Openings	4
• Installing Multiple Section Assemblies ...	5
• Maximum Assembly Tables	5
• Sleeve Length Requirements.....	6
• Securing the Damper/Sleeve Assembly to Wall/Floor Openings	7-9
• Duct to Sleeve Connection.....	10-11
• No Connecting Duct or Transfer Opening	12
Maintenance	12
Troubleshooting	12

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

General Information

"UL CLASSIFIED (see complete marking on product)"

"UL CLASSIFIED to Canadian safety standards (see complete marking on product)"

Standard 555 (Listing #R13317)

Installation Supplements

Refer to the appropriate Greenheck installation supplements for special requirements:

- Closed Indicator Switch
- Concrete Floor with Steel Deck
- Drive Slip Breakaway Connection
- Field Installed Sleeve
- Fire Resistant Ventilated Duct Assembly
- Firestop Material
- Fusible Link Replacement
- Grille Installation
- Metal Stud in Shaftwall Partition
- Non-Concrete Horizontal Mount
- Quick Connect Breakaway Connection
- Sealant Supplement
- Single Side Retaining Angle
- Single 3-Sided Retaining Angle Supplement
- Sleeve Extension
- Support Mullions

Installation supplements available at www.greenheck.com.

Pre-Installation Guidelines

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 and verify that the fusible link is in place and has not activated. Never install a fire damper without the proper UL approved fusible link in place. Visually inspect the link to verify its not damaged. Replace link as necessary.
- 2) Lift or handle damper using sleeve or frame. Do not lift damper using blades.
- 3) Dampers have a label indicating the required mounting orientation. Care must be taken to ensure that the indicated orientation is adhered to.
- 4) Damper must be installed into duct or opening square and free of twist or other misalignment.
- 5) Damper must be kept clean 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) Mortar dust
 - b) Drywall dust
 - c) Firesafing materials
 - d) Wall texture
 - e) Paint overspray
- 6) Damper should be sufficiently covered as to prevent overspray if wall texturing or spray painting will be performed within 5 feet of the damper.
- 7) Caulking is not necessary, nor is it allowed, between the damper sleeve and the wall or floor opening (annular space). However, caulking may be applied to the retaining angles.
- 8) ACCESS: Suitable access (such that the fusible link may be removed and the damper's blade stack may be reset, 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. (Refer to NFPA 90A).
- 9) The Code Authority Having Jurisdiction (AHJ) must evaluate and provide approval of final installation where variations to these instructions are necessary.

Preparation of Openings

- Frame wall openings as shown below (see Figure 1 & 2).
- Gypsum wall board must be fastened 12 in. (305mm) on center to all stud and runner flanges surrounding opening.
- Prepare opening between studs and sleeve assembly as shown below (see Figure 3 & 4).
- All construction and fasteners must meet the requirements of the appropriate wall design (See UL Fire Resistance Directory) and/or local codes.

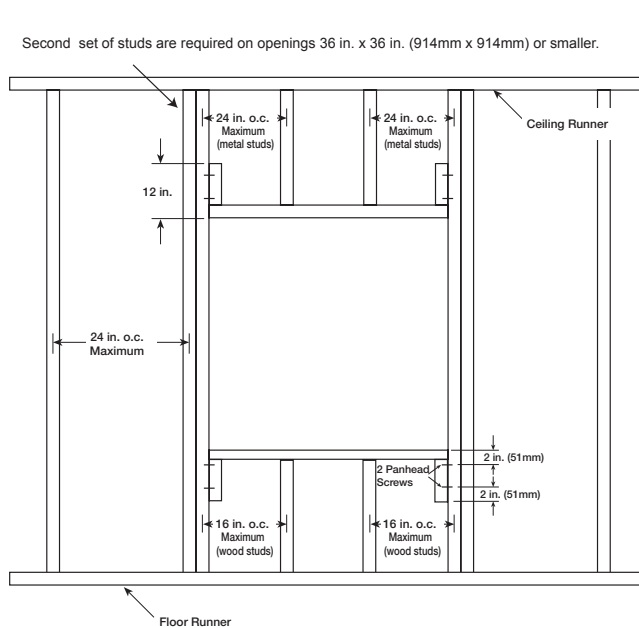


Figure 1

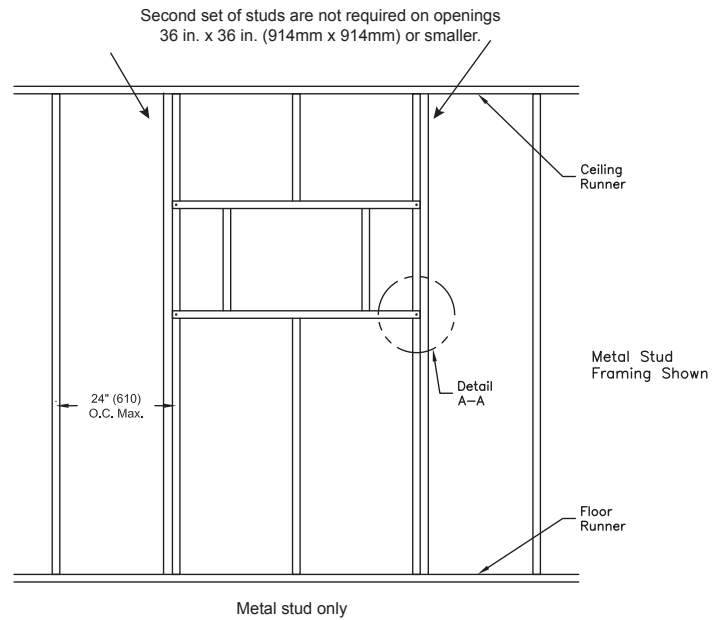


Figure 2

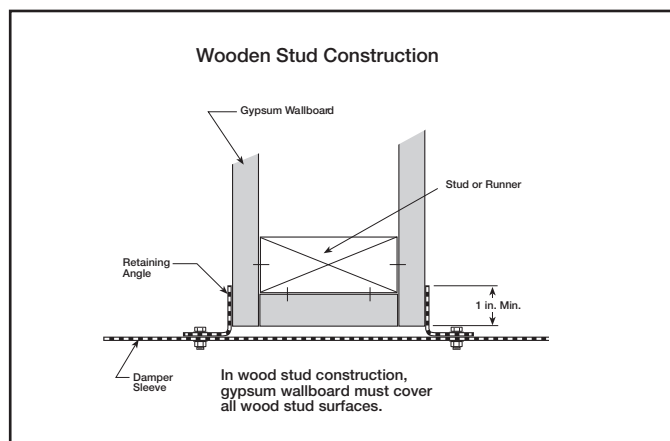
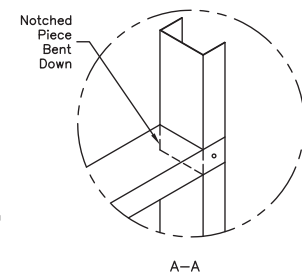


Figure 3 (2 sided angle installation shown)

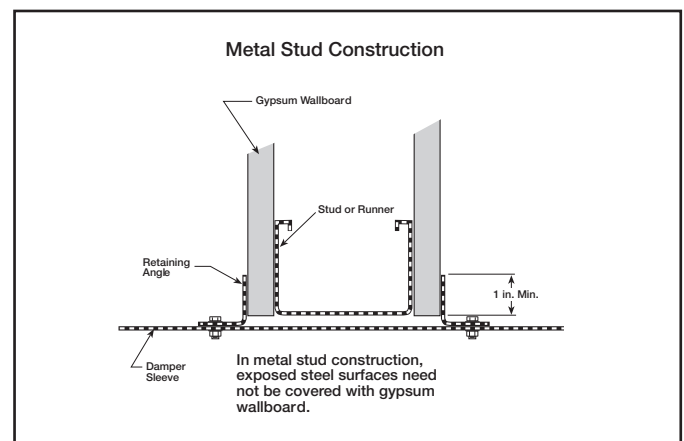


Figure 4 (2 sided angle installation shown)

Clearances Required Between Damper Sleeves & Wall/Floor Openings

Two-sided Angle Installation

Two sided angle installations require clearances for thermal expansion between the damper sleeve and the wall/floor opening. The minimum required clearances are:

- For galvanized steel fire dampers and sleeves: $\frac{1}{8}$ in. per foot (3mm per .3 m) of damper width and $\frac{1}{8}$ in. per foot (3mm per .3 m) height with a minimum clearance of $\frac{1}{4}$ in. (6mm), maximum of $1\frac{1}{2}$ in. (38mm).
- For stainless steel fire/smoke dampers and stainless steel or galvanized sleeves: $\frac{3}{16}$ in. per foot (5mm per .3 m) of damper width and height with a minimum clearance of $\frac{1}{4}$ in. (6mm), maximum of 2 in. (51mm).

These are total clearances (ignoring fastener heads) and do not need to be equally spaced around the damper.

Example:

A 12 in. x 12 in. (305mm x 305mm) will require a minimum clearance of $\frac{1}{4}$ in. (6mm) width and $\frac{1}{4}$ in. (6mm) on height

A 48 in. x 12 in. (1219mm x 305mm) damper will required a minimum clearance of $\frac{1}{2}$ in. (13mm) on width and $\frac{1}{4}$ in. (13mm) on height.

Although the minimum requirements are listed above, for ease of installation the following are the recommended clearances for galvanized dampers:

- Width/Height of 48 in. (1219 mm) or less - $\frac{1}{2}$ in. (13mm) clearance
- Width/Height between 48.01 in. (1220 mm) and 96 in. (2438 mm): 1 in. (25mm) clearance
- Width/Height greater than 96 in. (2438 mm): $1\frac{1}{2}$ in. (38 mm) clearance

Single Side Angle Installation

On vertical mount single side angle installations there are no minimum clearance requirements between the wall opening and the damper sleeve. However, to facilitate installation, clearances between the wall opening and the damper sleeve are recommended.

On horizontal mount single side angle installations a minimum clearance is required between the outside of the damper sleeve and the floor opening of $\frac{1}{8}$ in. per foot (3mm per .3m) of damper width and $\frac{1}{8}$ in. per foot (3mm per .3m) height with a minimum clearance of $\frac{1}{4}$ in. (6mm).

Installing Multiple Section Assemblies

A damper assembly is not restricted to a maximum number of sections, but must not exceed the section sizes and overall sizes shown (see chart below).

The damper sections must be attached together with #10 (3/4 in. max. [19mm]) sheet metal screws, 1/4 in. (6mm) diameter nuts and bolts, tack or spot welds, or 3/16 in. (48mm) diameter steel pop rivets. Attachments must be spaced a maximum of 6 in. (152mm) on centers and a maximum of 2 in. (51mm) from corners. Attachments must be made on front face and back face (air entering and air exiting side) of damper sections.

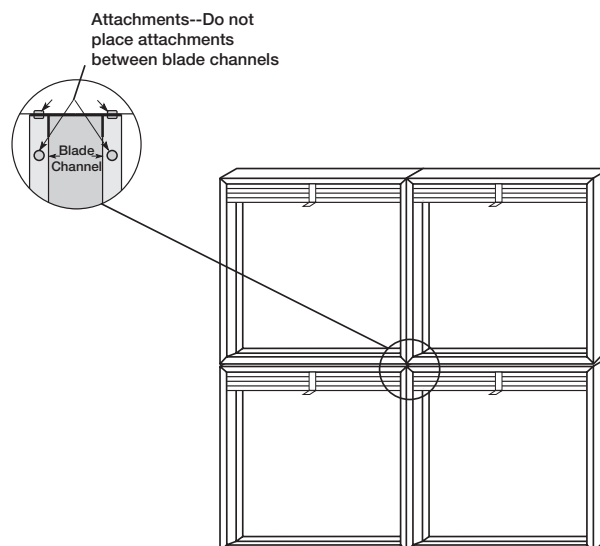


Figure 5

Maximum Assembly Tables

When multiple sections are shipped unassembled, installer shall fasten dampers together. The table shows maximum sizes for multiple section dampers. Dampers that are two or more sections tall must be factory assembled. **Note:** All dimensions are shown in inches (W x H). * Sizes listed is the damper size, not transition size.

Damper Model	Mounting	Maximum Single Section Damper Sizes*	Maximum Multi-Section Damper Sizes*
FD-100, FD-300, FD-310, SSFD-350	Vertical	48 X 48 (1219mm x 1219mm)	-
FD-150	Vertical or Horizontal	48 X 48 (1219mm x 1219mm)	96 x 48 (2438mm x 1219mm) or 120 x 40 (3048mm x 1016mm)
FD-110	Vertical or Horizontal	48 x 48 (1219mm x 1219mm)	96 x 48 (2438mm x 1219mm)
SSFD-150	Vertical	48 X 48 (1219mm x 1219mm)	96 X 48 (2438mm x 1219mm) or 120 X 40 (3048mm x 1016mm)
	Horizontal	36 x 36 (914mm x 914mm)	-
FD-350	Vertical	48 x 48 (1219mm x 1219mm)	-
	Horizontal	40 x 40 (1016mm x 1016mm)	80 x 40 (2032mm x 1016mm)
KFD-150	Vertical or Horizontal	36 x 16 (914mm x 406mm)	96 x 48 (2438mm x 1219mm) or 120 x 40 (3048mm x 1016mm)
KFD-110	Vertical or Horizontal	36 x 16 (914mm x 406mm)	96 x 48 (2438mm x 1219mm)
SSKFD-150	Vertical	36 x 16 (914mm x 406mm)	96 X 48 (2438mm x 1219mm) or 120 X 40 (3048mm x 1016mm)
KFD-350	Vertical	36 x 16 (914mm x 406mm)	-
	Horizontal	36 x 16 (914mm x 406mm)	80 x 40 (2032mm x 1016mm)
SSKFD-350	Vertical	36 x 16 (914mm x 406mm)	-
DFD-150, DFD-110	Vertical	36 x 36 (914mm x 914mm)	72 x 48 (1828mm x 1219mm) or 60 x 60 (1524mm x 1524mm) or 120 x 30 (3048mm x 762mm)
		24 x 18 (610mm x 457mm)	48 x 36 (1217mm x 914mm)
	Horizontal	30 x 30 (762mm x 762mm)	-
DFD-350	Vertical	36 x 36 (914mm x 914mm)	-
	Horizontal	24 x 18 (610mm x 457mm)	48 x 36 (1217mm x 914mm)
		30 x 30 (762mm x 762mm)	-
DFD-310	Vertical	36 x 36 (914mm x 914mm)	-
	Horizontal	30 x 30 (762mm x 762mm)	-
SSDFD-110, SSDFD-150, SSDFD-350	Vertical	30 x 30 (762mm x 762mm)	-
FD-150X	Vertical or Horizontal	48 x 48 (1219mm x 1219mm)	-
DFD-150X	Vertical	36 x 36 (914mm x 914mm)	-
	Horizontal	30 x 30 (762mm x 762mm)	-

Sleeve Requirements

All fire dampers must be installed in a steel sleeve of the required gauge and length. Note that DFD-150X and FD-150X series dampers are provided with an integral sleeve. See **Table on page 10** for required minimum sleeve gauges. Maximum sleeve thickness is 10 gauge (3.5mm). Sleeve inside dimensions must equal damper outside dimensions.

Sleeves shall extend a maximum of 6 in. (152mm) beyond the wall or floor opening on each side. When a factory mounted access door is incorporated as a part of the sleeve the sleeve may extend a maximum of 16 in. (406mm) beyond the wall or floor opening on the access door side.

Fire dampers must be attached to sleeves as shown in **Figure 6**. All four sides of the damper frame must be attached to the sleeve with one row of attachments on each side of the blade channel. Attachments must be spaced a maximum of 6 in. (152mm) on centers and a maximum of 2 in. (51mm) from corners. A minimum of 4 attachments (2 on each side of the blade channel) per side (16 per damper) are required. One of the methods of attachment shown below must be used:

- tack or spot welds
- #10 sheet metal screws
- 1/4 in. (6mm) bolts and nuts
- 3/16 in. (4.7mm) steel pop rivets

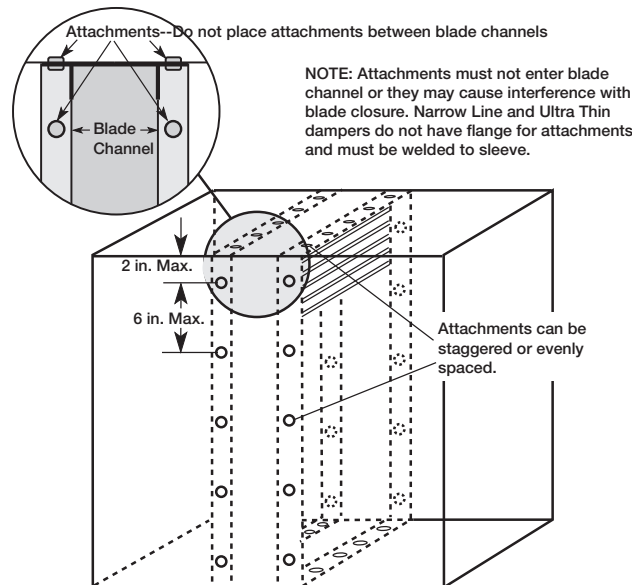


Figure 6: Field attachment of fire dampers to sleeves.

Securing the Damper/Sleeve Assembly to Wall/Floor Openings

All fire dampers may utilize the two sided angle installation method described below. 1½ hour rated fire dampers may use the single sided angle installation method up to the following maximum sizes:

- Vertical mount: 80 in. W x 50. in. H (2032mm W x 1270mm H), 50 in. W x 80 in. H (1270mm W x 2032mm H), or 40 in. W x 100 in. H (1016mm W x 2540mm).
- Horizontal mount: 144 in. W x 96 in. H (3658mm W x 2438mm H)
- **Retaining Angle Gauge:** Retaining angles for 1½ hour rated dampers with a width and height 48 in. (1219mm) or less must be a minimum of 20 ga. (1mm). Retaining angles for all 3 hour rated dampers and all dampers with a width or height greater than 48 in. (1219mm) must be a minimum of 16 gauge (1.5mm).
- **Retaining Angle Size:** The leg of the retaining angle on the damper sleeve shall be a minimum of 1¼ in. (32mm). The leg of the retaining angle on the wall/floor shall be long enough to cover the annular space and overlap the wall/floor by a minimum of 1 in. (25mm).
- **Retaining Angle Attachment to Sleeve:** Retaining angles must be attached to the damper using one or more of the following methods of attachment (refer to label on outside of sleeve for 'No Screw' area):
 - Tack or spot welds
 - #10 (¾ in. [19mm] max.) sheet metal screws
 - ¼ in. (6mm) bolts and nuts
 - ⅜ in. (5mm) steel pop rivets

A minimum of two connections per side, top, and bottom, 12 in. (305mm) O.C. maximum for openings of 48 in. W x 36 in. H (1219mm x 914mm) and less. Dampers greater than 48 in. wide (1219mm) or 36 in. high (914mm) require the connections to be no more than 6 in. (152mm) O.C.

The angles must be attached to all 4 sides of the sleeve. Ensure that fasteners do not interfere with the operation of the damper. The angles need not be attached to each other at the corners.

• Retaining Angle Attachment to Wall/Floor:

Two sided Angle Method: For two sided angle installations the retaining angles shall not be attached to the wall/floor (see Figure 7).

Single Sided Angle Method: For single side installations the retaining angles must be attached to the wall/floor (see Figures 8-11). For metal stud partitions only, the single-side mounting angle may be directly attached to the metal stud prior to the installation of the drywall.

- Retaining angles must be attached to the partition using one of the methods shown below:
 - Drywall screws of a length such that the screw engages the steel stud/track by ½ in. (13mm) (steel framing).
 - Drywall screws of a length such that the screw engages the wood stud by 1¾ in. (44mm) (wood framing).
 - Steel anchors or self tapping concrete screws penetrating masonry or block 1¼ in. (31mm).
- A minimum of two connections per side are required. Additional connections made at a maximum of 12 in. (305mm) O.C. maximum for openings of 48 in. W x 36 in. H (1219mm x 914mm) and less. Dampers greater than 48 in. wide (1219mm) or 36 in. high (914mm) require the connections to be no more than 6 in. (152mm) O.C.

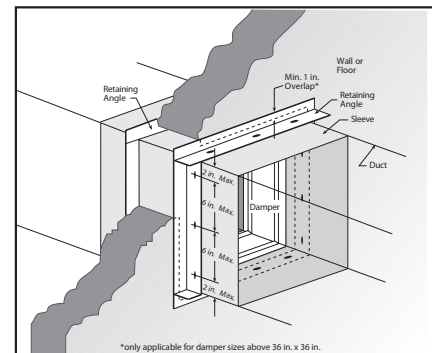


Figure 7: Two Sided Angle Installation

Securing the Damper/Sleeve Assembly to Wall/Floor Openings cont.....

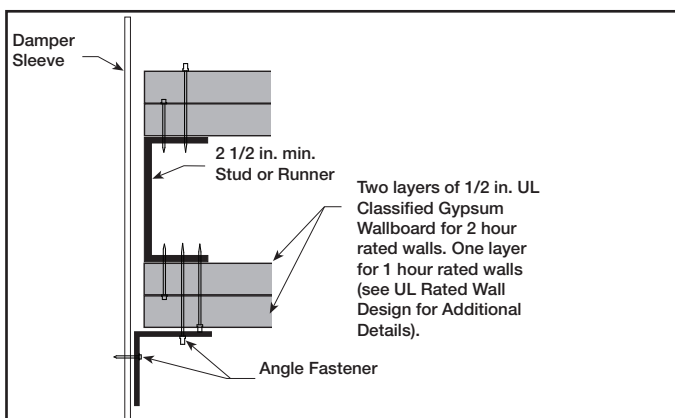


Figure 8: Single Side Angle With Steel Stud Wall - Angle Over Wallboard

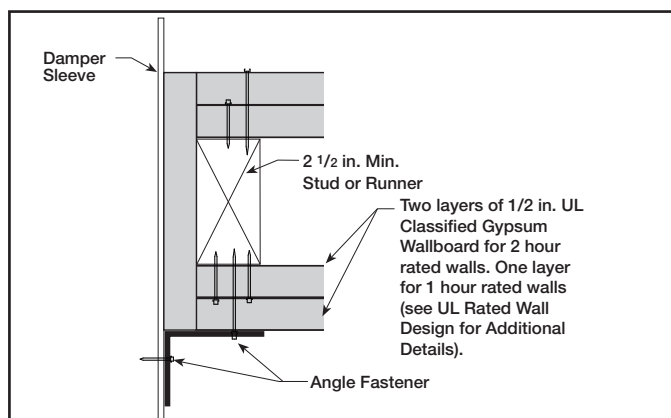


Figure 9: Single Side Angle With Wood Stud Wall

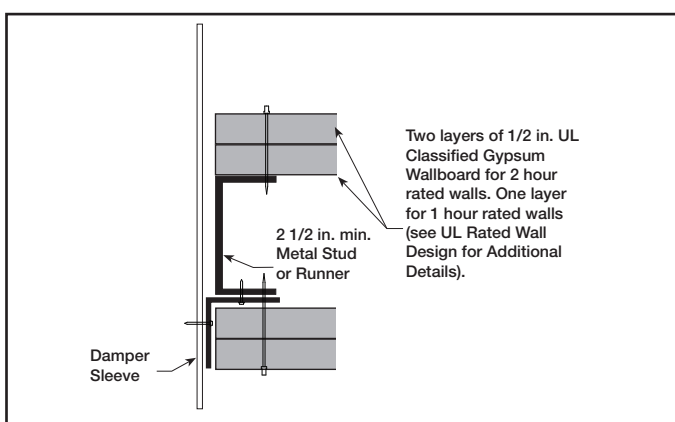


Figure 10: Single Side Angle With Steel Stud Wall - Angle Under Wallboard

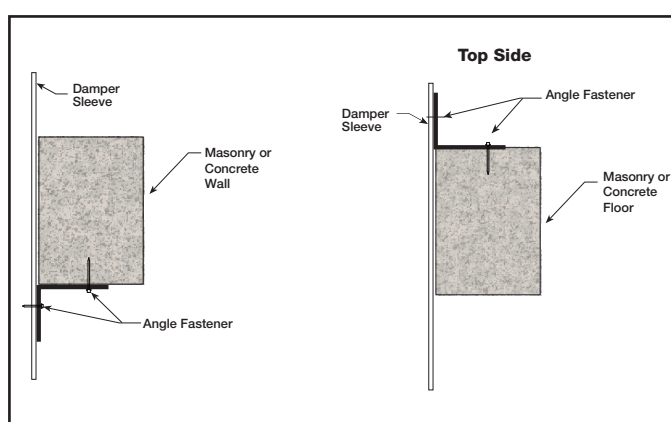


Figure 11: Single Side Angle With Masonry or Concrete Wall and Floor

Grille Installations (Dampers up to 36 in. x 36 in. [914mm x 914mm])

Retaining angles used in conjunction with grille installations must be a minimum of $\frac{5}{8}$ in. x 1 in. (15mm x 25mm) 16 gauge (1.5mm) steel. Space screws a maximum of 6 in. (152mm) on center and a maximum of 2 in. (51mm) from the corners (minimum of 2 screws per side). See **Figure 12** and **Figure 13**.

Note: Screws used to attach grille are allowed to penetrate reversed angle leg.

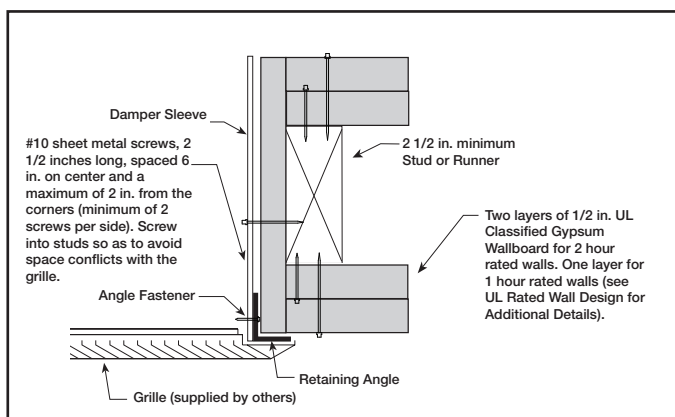


Figure 12: Wood Stud - Grille

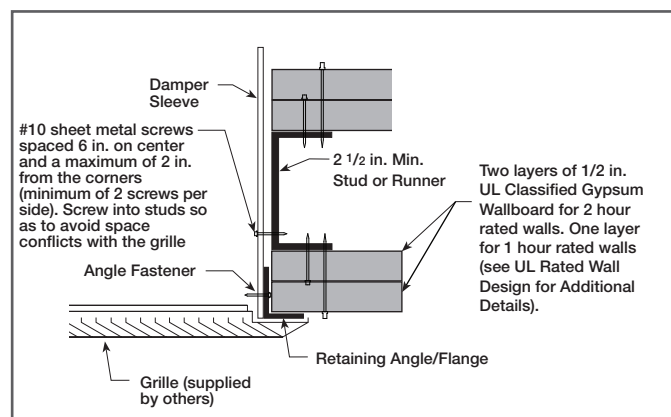
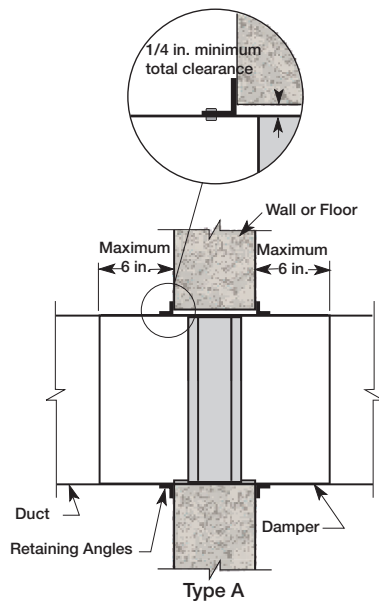
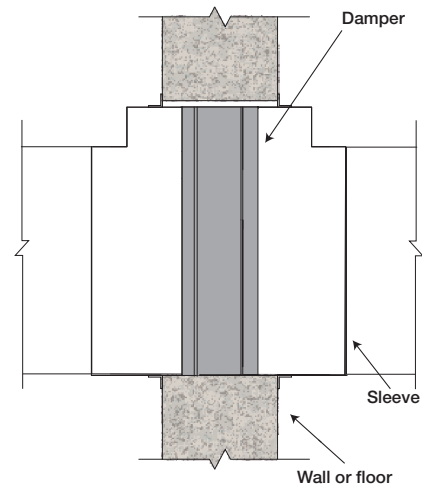


Figure 13: Metal Stud - Grille

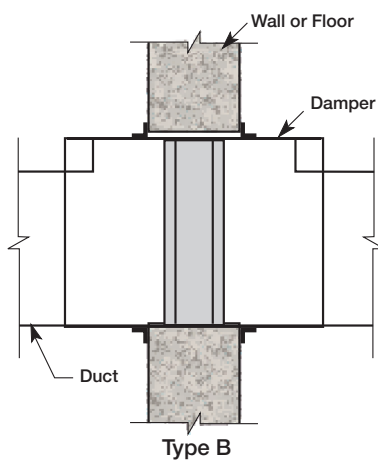
Securing the Damper/Sleeve Assembly to Wall/Floor Openings cont.....



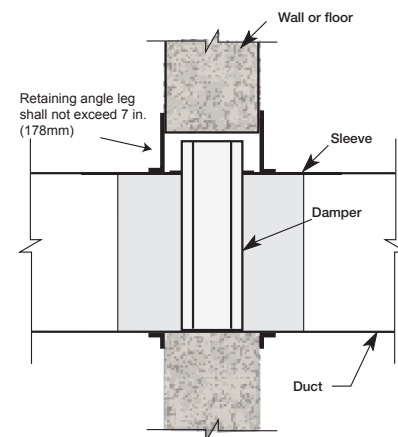
Factory or Field installed Sleeve



Type B2
Factory Sleeve

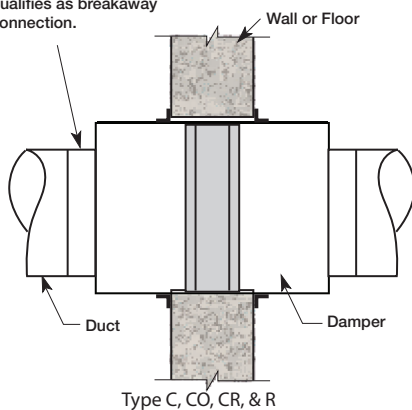


Factory Sleeve



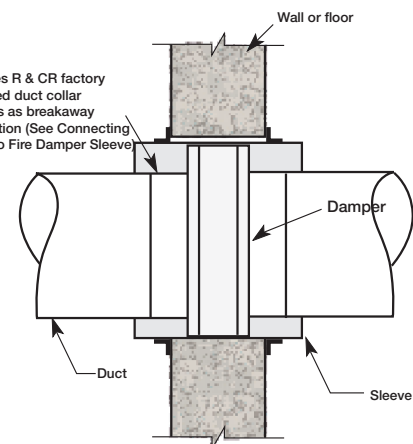
Type B
Field Installed Sleeve

On types R, CO & CR factory furnished duct collar qualifies as breakaway connection.



Type C, CO, CR, & R
Factory Sleeve

On types R & CR factory furnished duct collar qualifies as breakaway connection (See Connecting Ducts to Fire Damper Sleeve)



Type C, CO, CR & R
Field installed Sleeve

Figure 14: Damper/Sleeves with Transition

Duct to Sleeve Connection

Sleeve Gauge and Connection Type Requirements

The size of the damper/duct determines the required sleeve gauge and the required duct to sleeve connection (see table to the right). The sleeve thickness must also not be less than the gauge of the connecting duct. Any duct connection other than the breakaway connections described below are considered rigid.

Sleeve Gauge	Duct Dimension	Type of Duct to Sleeve Connection Permitted
14 ga. (0.075 in.) - 10 ga. (0.138 in.) [2mm - 3.5mm]	All duct sizes	Rigid or Breakaway
16 ga. (0.060 in.) [1.5mm]	36 in. (914mm) max. width 24 in. (610mm) max. height 24 in. (610mm) diameter	Rigid or Breakaway
16 ga. (0.060 in.) [1.5mm]	All duct sizes	Breakaway only
18 ga. (0.048 in.) [1.2mm]	85 in. (2159mm) wide and over	
20 ga. (0.036 in.) [0.9mm]	55 in. - 84 in. wide (1397mm - 2134mm)	
22 ga. (.030 in.) [0.76mm]	31 in. - 54 in. wide (787mm - 1372mm)	
24 ga. (0.024) [0.6mm]	13 in. - 30 in. wide (330mm - 762mm)	
26 ga. (0.018 in.) [0.46mm]	12 in. wide and under (305mm)	
See Breakaway Connection section for additional information. UL Standard 555 requires all ducts to terminate at fire damper sleeves.		

Approved Breakaway Connections

All breakaway connections described below may utilize the following duct sealants: PA2084T duct sealant adhesive manufactured by Precision, DP1010 water base duct sealant manufactured by Design Polymetrics, Grey Pookie, Ductmate PROseal®, or CL Ward S Seal in accordance with SMACNA recommendations.

Transverse Joints

The transverse joints shown below are approved as breakaway connections.

- A maximum of two #10 (19mm) sheet metal screws on each side and on the bottom may be used. The screws should be located in the center of the slip pocket and penetrate both sides of the slip pocket.
- Dampers up to 20 inches (508mm) high may use transverse joints on the top and bottom and Drive Slip joints (see **Figure 16**) on the sides.

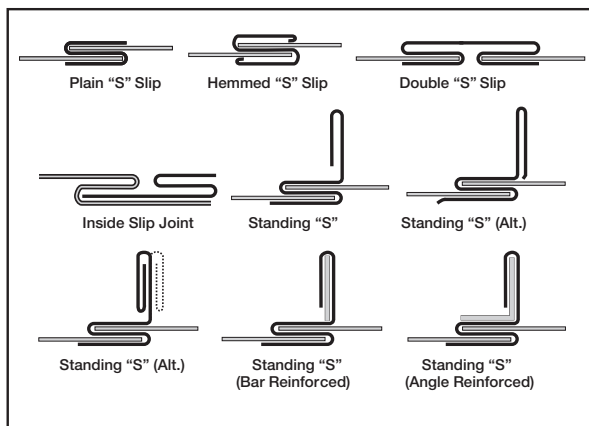


Figure 15 - Transverse Joints



Figure 16

Duct to Sleeve Connection cont....

Round and Oval Duct Breakaway Connections

Round or flat oval ducts connected to Type R or O damper collars shall be attached with #10 (19mm) sheet metal screws as follows:

- Ducts up to 22 in. (558mm) wide (or dia.) and less shall have three screws.
- Ducts larger than 22 in. (558mm) wide (or dia.) up to and including 36 in. (914mm) wide (or dia.) shall have five screws.

Factory furnished duct collars, type R and O, are also considered breakaway (see Figure 17).

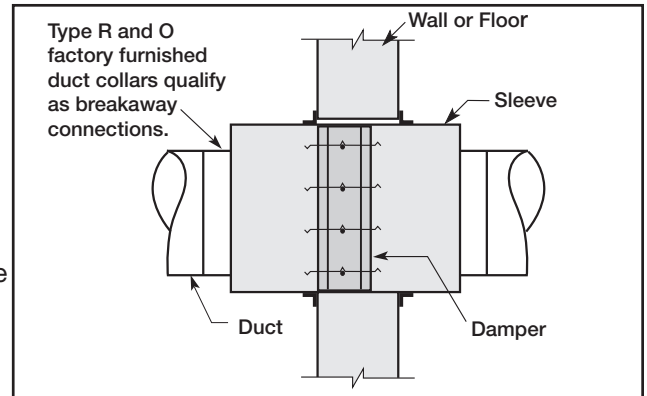


Figure 17: Type R and O Transition

Manufactured Flanged System Breakaway Connections

Flanged connection systems manufactured by Ductmate, Durodyne, Ward, Nexus, Radiant T-35m, and MEZ are approved as breakaway connections when installed as illustrated (see Figure 18).

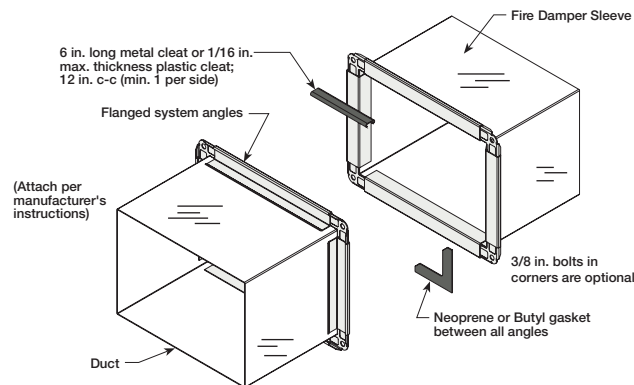


Figure 18

Proprietary Flange System Breakaway Connections

(TDC by Lockformer, TDF by Engle)

TDC and TDF systems are approved as breakaway connections when installed as described in the TDC or TDF addendum to the SMACNA Duct Construction. Standard 6 in. (152mm) metal clip may be used with spacing as shown in diagram (see Figure 19 & 20). 3/8 in. (9.5mm) metal bolts and nuts may be used to fasten together corner pieces (see Figure 21).

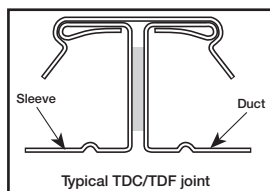


Figure 19

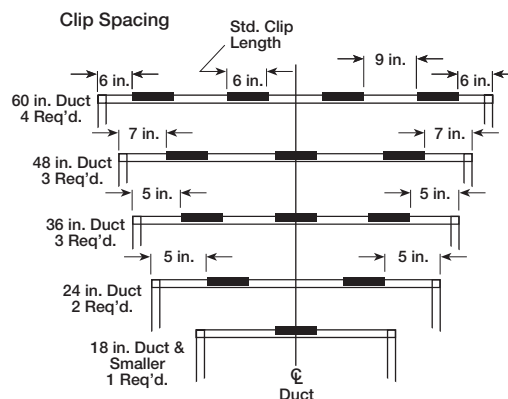


Figure 20

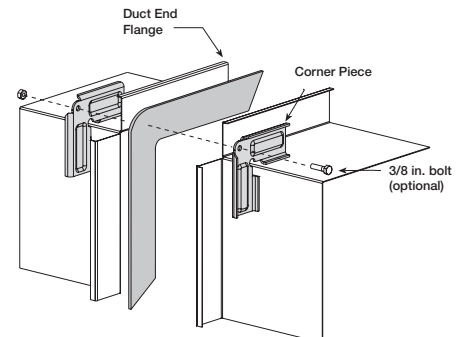


Figure 21

No Connecting Duct or Transfer Opening

Openings where duct does not attach on either side will not require a breakaway connection. Transfer openings are typical of a non-ducted installation (see **Figure 22**).

- Sleeve may end flush with the rated wall/floor on both sides
- Refer to Securing the Damper/Sleeve Assembly to Wall/Floor Openings for securing retaining angles to the sleeve.

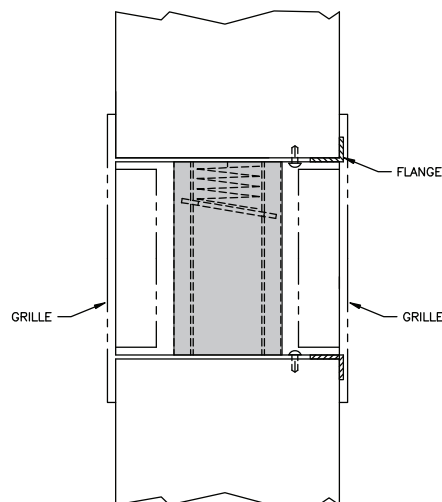


Figure 22: Transfer opening or no connecting duct

Damper Maintenance

Dampers do not typically require maintenance as long as they are kept dry and clean. If cleaning is necessary, use mild detergents or solvents. If lubrication is desired for components such as axle bearings, jackshaft bearings and jamb seals, do not use oil-based lubricants or any other lubricants that attract contaminants such as dust.

Damper Troubleshooting

The following is a possible cause and correction list for common concerns with the dampers.

Symptom	Possible Cause	Corrective Action
Damper does not fully open and/or close	Frame is 'racked' causing blades to bind on jamb seals	Adjust frame such that it is square and plumb
	Screws in damper linkage	Damper installed too far into wall. Move out to line as designated on damper label
	Contaminants on damper	Clean with a non-oil based solvent (see Damper Maintenance)
Link separated	Heat	Replace link



Our Commitment

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Specific Greenheck product warranties can be located on greenheck.com within the product area tabs and listed in the Library under Warranties.



Phone: (715) 359-6171 • Fax: (715) 355-2399 • E-mail: gfcinfo@greenheck.com • Website: www.greenheck.com

Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage!

These instructions apply to 1½ and 3 hour rated fire and combination fire smoke dampers mounted in: 1) masonry, block, or stud walls and 2) concrete floors. Specific requirements in these instructions are mandatory. Dampers must be installed in accordance with these instructions to meet the requirements of UL 555 and/or UL 555S.

Note: Combination fire smoke and fire dampers are manufactured and labeled for either vertical or horizontal installation. The dampers must be installed in accordance with labeling.



Table of Contents

General Information	2
Pre-Installation Guidelines	2
Electrical Guidelines	2
Installation	3-11
• Preparation of Openings	3
• Clearances Required Between Damper Sleeves & Wall/Floor Openings	4
• Installing Multiple Damper Section Assemblies	5
• Maximum Assembly Tables	5
• Inserting Damper into Wall/Floor Openings	6
• Securing the Damper/Sleeve Assembly to Wall/Floor Openings	7-8
• Duct to Sleeve Connection	9-10
• Actuator & Temperature Response Device Connections	11
Maintenance	12
Troubleshooting	12

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 (38°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.

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.

General Information

“UL CLASSIFIED (see complete marking on product)”

“UL CLASSIFIED to Canadian safety standards (see complete marking on product)”

Standard 555 & 555S (Listing #R13317)

Installation Supplements

Refer to the appropriate Greenheck installation supplements for special requirements:

- Concrete Floor with Steel Deck
- Drive Slip Breakaway Connection
- Field Installed Sleeve
- Fire Resistant Ventilated Duct Assembly
- Firestop Material
- Fusible Link Replacement
- Greenheck Test Switch
- Grille Installation
- Metal Stud in Shaftwall Partition
- Non-Concrete Horizontal Mount
- Open or Close Indicator (OCI)
- Quick Connect Breakaway Connection
- Resettable Link (RRL)
- Resettable Link with Blade Indicator (RRL/OCI)
- Sealant Supplement
- Single 3-Sided Retaining Angle Supplement
- Sleeve Extension
- Smoke Detector - Various Types
- Temperature Limited Override (TOR)
- Tunnel Corridor

Installation supplements available at www.greenheck.com.

Electrical Guidelines

Electrical Guidelines

All wiring shall be done in accordance with the National Electrical Code ANSI/NFPA-70 latest edition, any local codes that may apply, and wiring diagrams developed in compliance with the job or project design and specifications.

Important!

Electrical input may be needed for this equipment. This work should be performed by a qualified electrician. Verify power before wiring actuator. Greenheck is not responsible for any damage to, or failure of the unit caused by incorrect field wiring. To avoid causing death or serious bodily harm to building occupants, follow all instructions carefully. Dampers must close completely to preserve the integrity of the fire smoke separation.

Pre-Installation Guidelines

The following items will aid in completing the damper installation in a timely and effective manner.

- 1) Check the drawings for proper damper locations within the building. Visually inspect the damper for damage and verify that the Reusable Resettable Link (RRL) is in place and has not activated if provided. These electric links have a button for resetting. Visually inspect the link to verify its not missing or broken. Replace link as necessary.
- 2) Lift or handle damper using sleeve or frame. Do not lift damper using blades or actuators.
- 3) Damper has label on outside of sleeve indicating a ‘No Screw’ area. Do not install screws into this area as screws may interfere with unexposed blade linkage and prevent damper blades from opening and/or closing.
- 4) Damper has label indicating position of damper and sleeve assembly in the wall. Install accordingly to comply with manufacturer’s appropriate UL Classification file number.
- 5) Damper must be installed into duct or opening square and free of twist or other misalignment. Out of square, racked, twisted or misaligned installations can cause excessive leakage and/or torque requirements to exceed damper/actuator design.
- 6) Damper and actuator must be kept clean 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) Mortar dust
 - b) Drywall dust
 - c) Firesafing materials
 - d) Wall texture
 - e) Paint overspray
- 7) Damper should be sufficiently covered as to prevent overspray if wall texturing or spray painting will be performed within 5 feet of the damper. Excessive dirt or foreign material deposits on the damper can cause excessive leakage and/or torque requirements to exceed damper/actuator design.
- 8) Caulking is not necessary, nor is it allowed, between the damper sleeve and the wall or floor opening (annular space). However, caulking may be applied to the retaining angles.
- 9) ACCESS: Suitable access (such that RRL’s and actuators can be maintained, 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. (Refer to NFPA 90A).
- 10) The Code Authority Having Jurisdiction (AHJ) must evaluate and provide approval of final installation where variations to these instructions are necessary.

Preparation of Openings

- Frame wall openings as shown below (see **Figure 1 & 2**).
- Gypsum wall board must be fastened 12 in. (305mm) on center to all stud and runner flanges surrounding opening.
- Prepare opening between studs and sleeve assembly as shown below (see **Figure 3 & 4**).
- All construction and fasteners must meet the requirements of the appropriate wall design (See UL Fire Resistance Directory) and/or local codes.

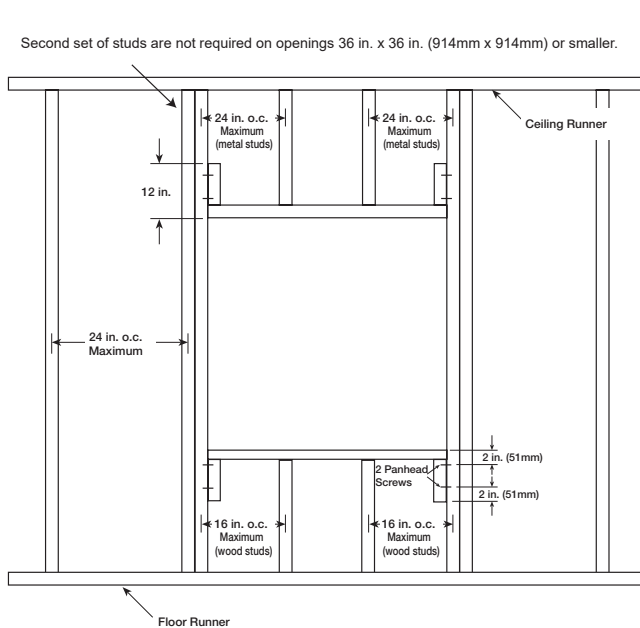


Figure 1

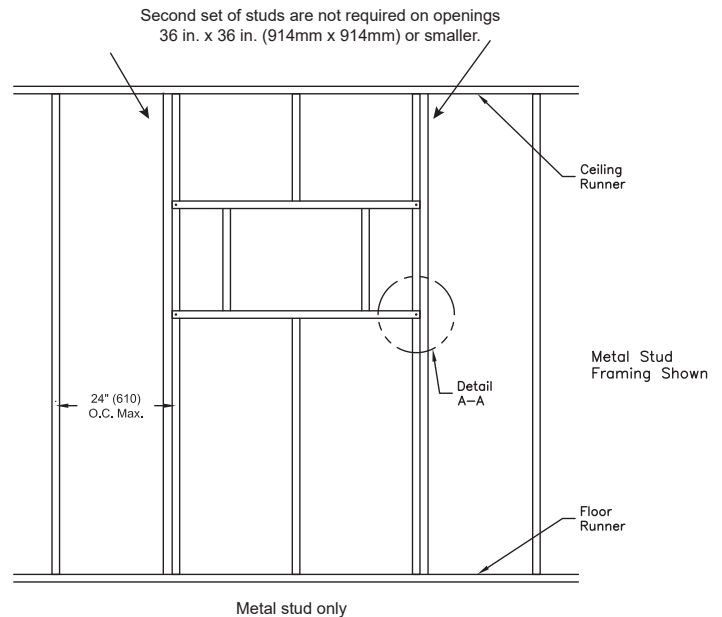


Figure 2

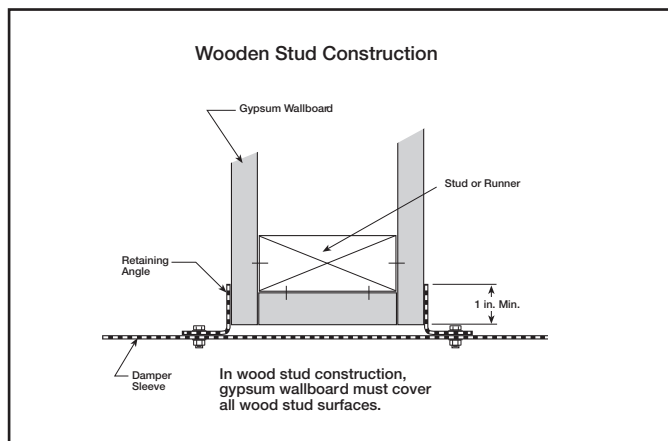
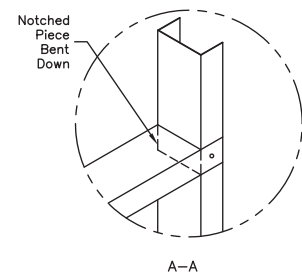


Figure 3 (2 sided angle installation shown)

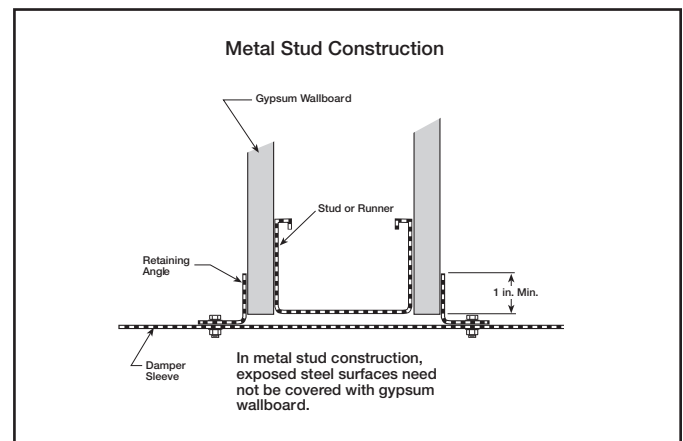


Figure 4 (2 sided angle installation shown)

Clearances Required Between Damper Sleeves & Wall/Floor Openings

Two-sided Angle Installation

Two sided angle installations require clearances for thermal expansion between the damper sleeve and the wall/floor opening. The minimum required clearances are:

- For galvanized steel fire dampers and sleeves: $\frac{1}{8}$ in. per foot (3mm per .3 m) of damper width and $\frac{1}{8}$ in. per foot (3mm per .3 m) height with a minimum clearance of $\frac{1}{4}$ in. (6mm), maximum of $1\frac{1}{2}$ in. (38mm).
- For stainless steel fire/smoke dampers and stainless steel or galvanized sleeves: $\frac{3}{16}$ in. per foot (5mm per .3 m) of damper width and height with a minimum clearance of $\frac{1}{4}$ in. (6mm), maximum of 2 in. (51mm).

These are total clearances (ignoring fastener heads) and do not need to be equally spaced around the damper.

Example:

A 12 in. x 12 in. (305mm x 305mm) will require a minimum clearance of $\frac{1}{4}$ in. (6mm) width and $\frac{1}{4}$ in. (6mm) on height
A 48 in. x 12 in. (1219mm x 305mm) damper will required a minimum clearance of $\frac{1}{2}$ in. (13mm) on width and $\frac{1}{4}$ in. (13mm) on height.

Although the minimum requirements are listed above, for ease of installation the following are the recommended clearances for galvanized dampers:

- Width/Height of 48 in. (1219 mm) or less - $\frac{1}{2}$ in. (13mm) clearance
- Width/Height between 48.01 in. (1220 mm) and 96 in. (2438 mm): 1 in. (25mm) clearance
- Width/Height greater than 96 in. (2438 mm): $1\frac{1}{2}$ in. (38 mm) clearance

Single Side Angle Installation

On vertical mount single side angle installations there are no minimum clearance requirements between the wall opening and the damper sleeve. However, to facilitate installation, clearances between the wall opening and the damper sleeve are recommended.

On horizontal mount single side angle installations a minimum clearance is required between the outside of the damper sleeve and the floor opening of $\frac{1}{8}$ in. per foot (3mm per .3m) of damper width and $\frac{1}{8}$ in. per foot (3mm per .3m) height with a minimum clearance of $\frac{1}{4}$ in. (6mm).

Installing Multiple Section Damper Assemblies

A damper assembly is not restricted to a maximum number of sections, but must not exceed the section sizes and overall sizes shown (see chart below).

Some multiple section high damper assemblies require additional structural support between the damper frames. The following multiple section high damper assemblies require the use of either a support mullion between the damper frames as shown in **Figure 5** or individual sleeves around each row of dampers as shown in **Figure 6**:

- All horizontal mount dampers
- All vertical mount dampers over 72 in. (1829mm) high and greater than 2 sections wide
- All vertical mount dampers rated for more than 4 in. wg (1 kPa)
- All vertical mount dampers that use fusible links as a closure device

The damper sections must be attached together with #10 (3/4 in. max. [19mm]) sheet metal screws, 1/4 in. (6mm) diameter nuts and bolts, tack or spot welds, or 3/16 in. (48mm) diameter steel pop rivets. Attachments must be spaced a maximum of 6 in. (152mm) on centers and a maximum of 2 in. (51mm) from corners. Attachments must be made on front face and back face (air entering and air exiting side) of damper sections.

Note: Dampers ordered for individual installation may not be installed together. The full assembly size must be specified at the time the dampers are ordered.

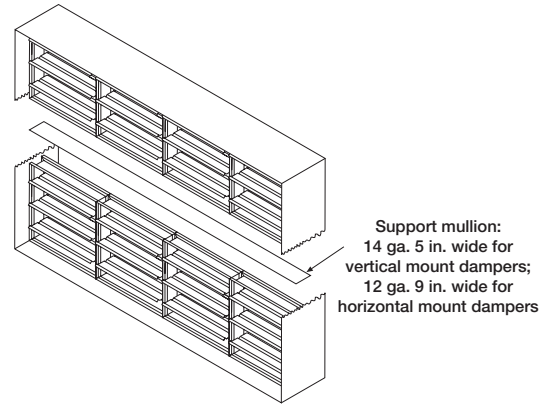


Figure 5: Single sleeve around outside with support mullion

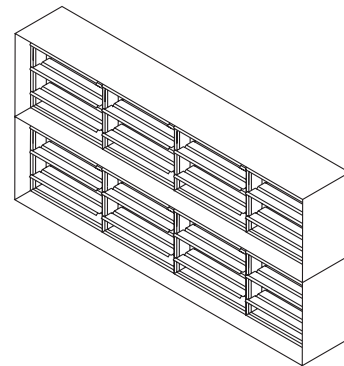


Figure 6: Two individually sleeved units with no mullions

Maximum Assembly Tables

Horizontal Mount

Damper Model	Maximum Single Section Size (inches)	Maximum Overall Size for Multi-Section Dampers (inches)
DFD-210	36 x 36 or 32 x 50	128 x 96
DFD-230	36 x 36 or 32 x 48	72 x 48
DFDAF-310	32 x 50	144 x 96
DFDTF-210	32 x 36	96 x 72
	32 x 48	64 x 48 or 32 x 96
FSD-211, 212, 213	36 x 48 or 32 x 50	144 x 96
FSD-211M, 212M	30 x 36	144 x 72
FSD-231	36 x 36 or 32 x 48	72 x 48
FSD-231M	36 x 36	72 x 48
FSD-311, 312	32 x 50	144 x 96
FSD-311M, 312M	32 x 50	128 x 96
FSD-331, DFDAF-330	30 x 48	144 x 96
IMO-310	32 x 50	NA
IMO-311	32 x 50	NA
SEDFD-210, SEFSD-211	24 x 30	48 x 30
SSFSD-211	24 x 30	48 x 30

Vertical Mount

Damper Model	Maximum Single Section Size (inches)	Maximum Overall Size for Multi-section Dampers (inches)
DFD-210	36 x 36 or 32 x 50	128 x 100
DFD-230	36 x 36 or 32 x 50	72 x 48
DFDAF-310	32 x 50	128 x 100
DFDTF-210	32 x 36	96 x 72
	32 x 50	64 x 50
FSD-211, 212, 213	36 x 48 or 32 x 50	128 x 100
FSD-231	36 x 36 or 32 x 48	72 x 48
FSD-311, 311M, 312, 312M	32 x 50	128 x 100
FSD-311V	50 X 32	100 x 32
FSD-331, DFDAF-330	32 x 36 or 30 x 48	120 x 96
IMO-311	32 x 50	NA
	32 x 50	NA
SEDFD-210, SSDFD-210	24 x 30 or 22 x 36	48 x 30
SEFSD-211, SSFSD-211	24 x 30 or 22 x 36	88 x 72

Note: FSD model dampers fitted with a fusible link closure device are limited to single section sizes.

Inserting Damper into Wall/Floor Openings

Insert the sleeved damper assembly into the prepared opening. Refer to label on outside of sleeve for the recommended location of the damper in the wall or floor (see Dimension A and Detail 1, **Figure 7**).

Special attention must be paid to ensure the following:

- 1) The $\varnothing$ (centerline) of the damper frame remains within the plane of the wall or floor
- 2) Attachments made through the retaining angle do not penetrate the 'No Screw' area designated on the damper sleeve.
- 3) The sleeve does not extend more than 16 in. (406mm) beyond the wall or floor on the actuator side of the damper and 6 in. (152mm) on the side opposite the actuator. The sleeve may also extend up to 16 in. (406mm) beyond the wall or floor if the damper has a factory supplied access door.

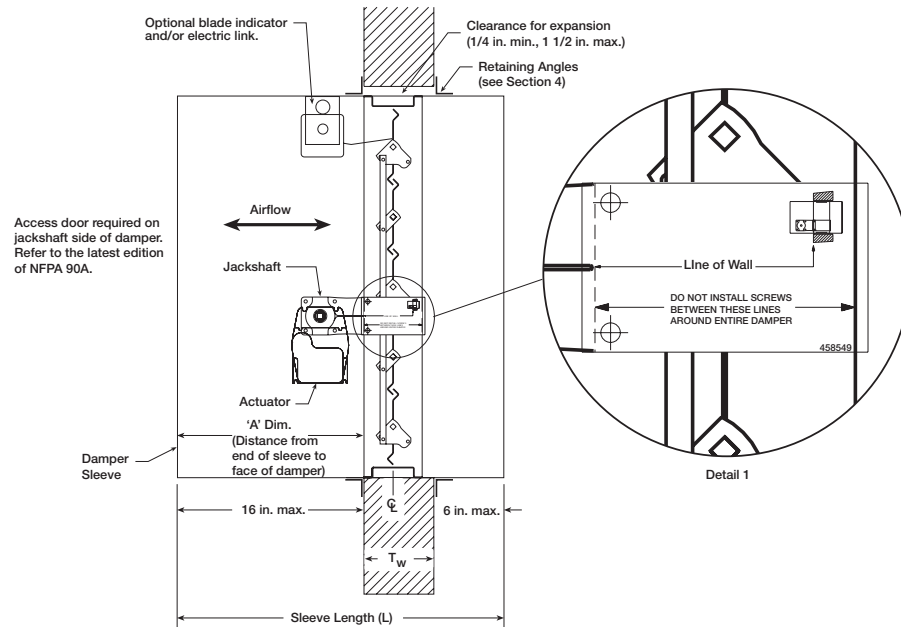


Figure 7: Properly Installed Combination fire smoke damper

Most fire and combination fire smoke dampers come with factory supplied sleeves. For field supplied sleeves, see the Field Supplied Sleeves supplement at www.greenheck.com. The following are recommended sleeve lengths for various wall thicknesses:

Wall Thickness Dimension (T_w)	Recommended Sleeve Length Dimension (L)
4 - 6 in. (102mm - 152mm)	16 in. (406mm)
7 - 10 in. (178mm - 254mm)	21 in. (533mm)
11 - 13 in. (279mm - 330mm)	24 in. (610mm)

Securing the Damper/Sleeve Assembly to Wall/Floor Openings

All fire and combination fire smoke dampers may utilize the two sided angle installation method described below. 1½ hour rated fire and combination fire smoke dampers may use the single sided angle installation method up to the following maximum sizes:

- Vertical mount: 80 in. W x 50. in. H (2032mm W x 1270mm H), 50 in. W x 80 in. H (1270mm W x 2032mm H), or 40 in. W x 100 in. H (1016mm W x 2540mm).
- Horizontal mount: 144 in. W x 96 in. H (3658mm W x 2438mm H)

- **Retaining Angle Gauge:** Retaining angles for 1½ hour rated dampers with a width and height 48 in. (1219mm) or less must be a minimum of 20 ga. (1mm). Retaining angles for all 3 hour rated dampers and all dampers with a width or height greater than 48 in. (1219mm) must be a minimum of 16 gauge (1.5mm).
- **Retaining Angle Size:** The leg of the retaining angle on the damper sleeve shall be a minimum of 1¼ in. (32mm). The leg of the retaining angle on the wall/floor shall be long enough to cover the annular space and overlap the wall/floor by a minimum of 1 in. (25mm).
- **Retaining Angle Attachment to Sleeve:** Retaining angles must be attached to the damper using one or more of the following methods of attachment (refer to label on outside of sleeve for 'No Screw' area):
 - Tack or spot welds
 - #10 (¾ in. [19mm] max.) sheet metal screws
 - ¼ in. (6mm) bolts and nuts
 - ⅜ in. (5mm) steel pop rivets

A minimum of two connections per side, top, and bottom, 12 in. (305mm) O.C. maximum for openings of 48 in. W x 36 in. H (1219mm x 914mm) and less. Dampers greater than 48 in. wide (1219mm) or 36 in. high (914mm) require the connections to be no more than 6 in. (152mm) O.C.

The angles must be attached to all 4 sides of the sleeve. Ensure that fasteners do not interfere with the operation of the damper. The angles need not be attached to each other at the corners.

- **Retaining Angle Attachment to Wall/Floor:**

Two sided Angle Method: For two sided angle installations the retaining angles shall not be attached to the wall/floor (see **Figure 8**).

Single Sided Angle Method: For single side installations the retaining angles must be attached to the wall/floor (see **Figures 9-12**). For metal stud partitions only, the single-side mounting angle may be directly attached to the metal stud prior to the installation of the drywall.

- Retaining angles must be attached to the partition using one of the methods shown below:
 - Drywall screws of a length such that the screw engages the steel stud/track by ½ in. (13mm) (steel framing).
 - Drywall screws of a length such that the screw engages the wood stud by 1¾ in. (44mm) (wood framing).
 - Steel anchors or self tapping concrete screws penetrating masonry or block 1¼ in. (31mm).
- A minimum of two connections per side are required. Additional connections made at a maximum of 12 in. (305mm) O.C. maximum for openings of 48 in. W x 36 in. H (1219mm x 914mm) and less. Dampers greater than 48 in. wide (1219mm) or 36 in. high (914mm) require the connections to be no more than 6 in. (152mm) O.C.

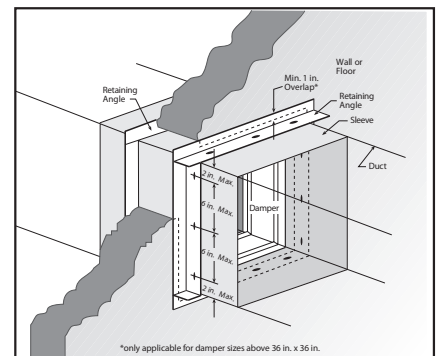


Figure 8: 2 sided angle installation method

Securing the Damper/Sleeve Assembly to Wall/Floor Openings cont.....

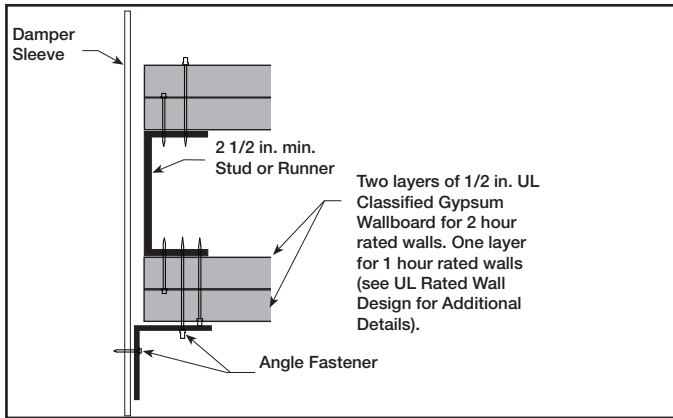


Figure 9: Single Side Angle With Steel Stud Wall - Angle Over Wallboard

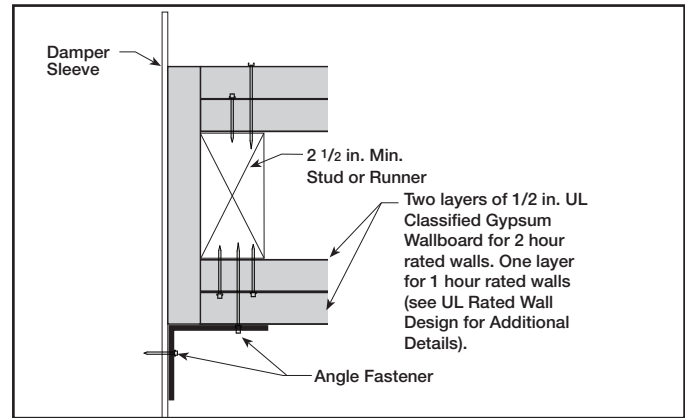


Figure 10: Single Side Angle With Wood Stud Wall

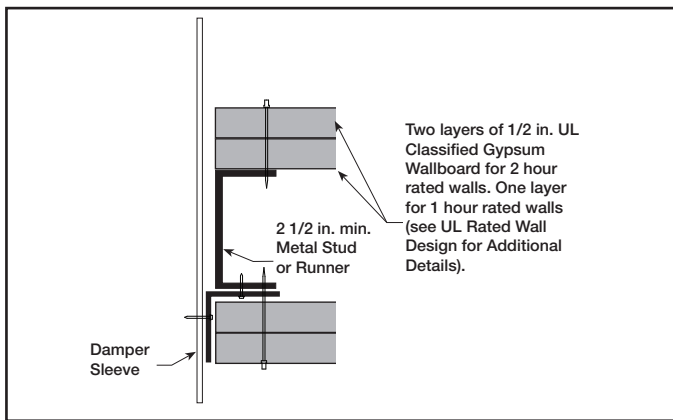


Figure 11: Single Side Angle With Steel Stud Wall - Angle Under Wallboard

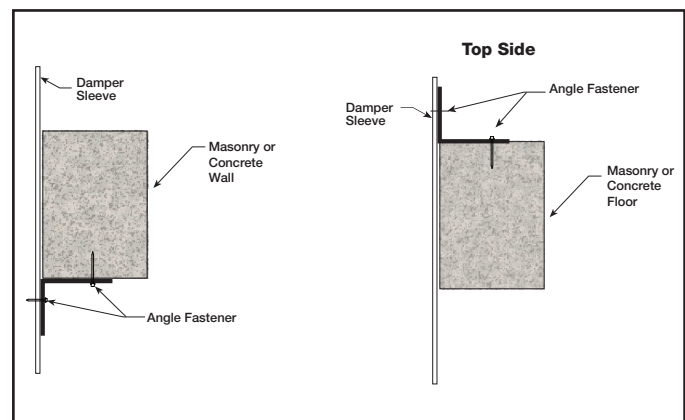


Figure 12: Single Side Angle With Masonry or Concrete Wall and Floor

Grille Installations (Dampers up to 36 in. x 36 in. [914mm x 914mm])

Retaining angles used in conjunction with grille installations must be a minimum of $\frac{5}{8}$ in. x 1 in. (15mm x 25mm) 16 gauge (1.5mm) steel. Space screws a maximum of 6 in. (152mm) on center and a maximum of 2 in. (51mm) from the corners (minimum of 2 screws per side). See **Figure 13** and **Figure 14**.

Note: Screws used to attach grille are allowed to penetrate reversed angle leg.

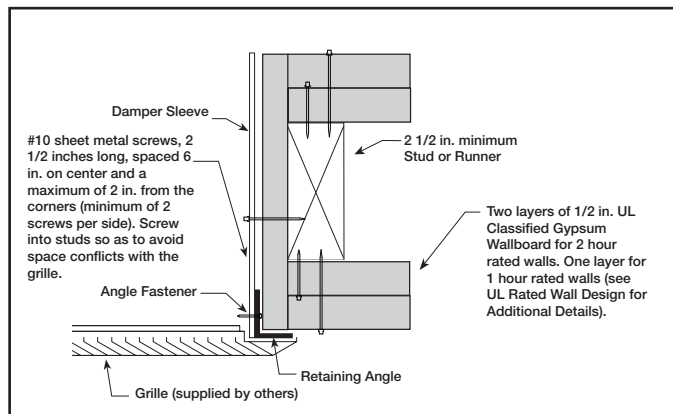


Figure 13: Wood Stud - Grille

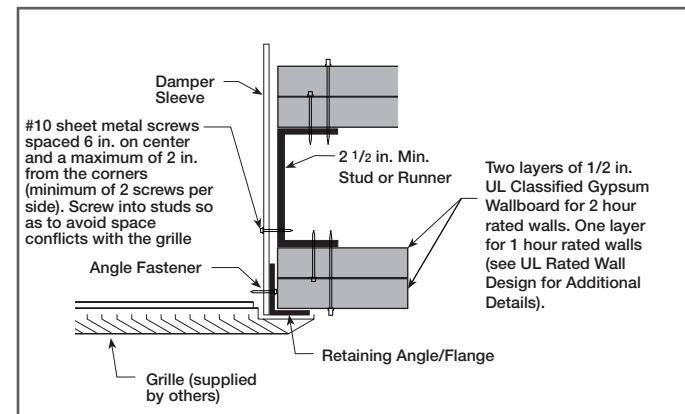


Figure 14: Metal Stud - Grille

Duct to Sleeve Connection

Sleeve Gauge and Connection Type Requirements

The size of the damper/duct determines the required sleeve gauge and the required duct to sleeve connection (see table to the right). The sleeve thickness must also not be less than the gauge of the connecting duct. Any duct connection other than the breakaway connections described below are considered rigid.

Sleeve Gauge	Duct Dimension	Type of Duct to Sleeve Connection Permitted
14 ga. (0.075 in.) - 10 ga. (0.138 in.) [2mm - 3.5mm]	All duct sizes	Rigid or Breakaway
16 ga. (0.060 in.) [1.5mm]	36 in. (914mm) max. width 24 in. (610mm) max. height 24 in. (610mm) diameter	Rigid or Breakaway
16 ga. (0.060 in.) [1.5mm]	All duct sizes	Breakaway only
18 ga. (0.048 in.) [1.2mm]	85 in. (2159mm) wide and over	
20 ga. (0.036 in.) [0.9mm]	55 in. - 84 in. wide (1397mm - 2134mm)	
22 ga. (.030 in.) [0.76mm]	31 in. - 54 in. wide (787mm - 1372mm)	
24 ga. (0.024) [0.6mm]	13 in. - 30 in. wide (330mm - 762mm)	
26 ga. (0.018 in.) [0.46mm]	12 in. wide and under (305mm)	
See Breakaway Connection section for additional information. UL Standard 555 requires all ducts to terminate at fire damper sleeves.		

Approved Breakaway Connections

All breakaway connections described below may utilize the following duct sealants: PA2084T duct sealant adhesive manufactured by Precision, DP1010 water base duct sealant manufactured by Design Polymetrics, Grey Pookie, Ductmate PROseal®, or CL Ward S Seal in accordance with SMACNA recommendations.

Transverse Joints

The transverse joints shown below are approved as breakaway connections.

- A maximum of two #10 (19mm) sheet metal screws on each side and on the bottom may be used. The screws should be located in the center of the slip pocket and penetrate both sides of the slip pocket.
- Dampers up to 20 inches (508mm) high may use transverse joints on the top and bottom and Drive Slip joints (see Figure 16) on the sides.

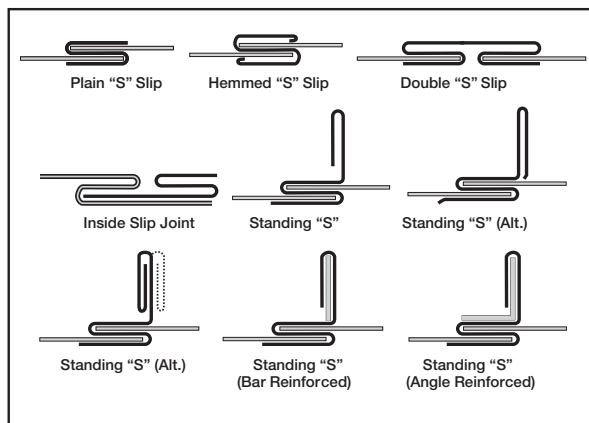


Figure 15 - Transverse Joints



Figure 16

Approved Breakaway Connections....

Round and Oval Duct Breakaway Connections

Factory furnished duct collars, type R and O, are also considered breakaway (see Figure 17).

Round or flat oval ducts connected to Type R or O damper collars shall be attached with #10 (19mm) sheet metal screws as follows:

- Ducts up to 22 in. (558mm) wide (or dia.) and less shall have three screws.
- Ducts larger than 22 in. (558mm) wide (or dia.) up to and including 36 in. (914mm) wide (or dia.) shall have five screws.

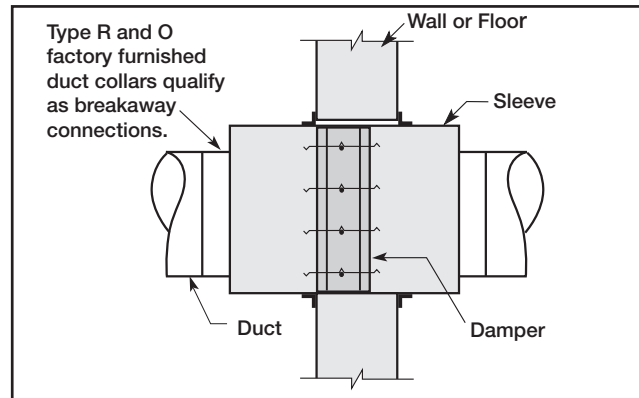


Figure 17: Type R and O Transition

Manufactured Flanged System Breakaway Connections

Flanged connection systems manufactured by Ductmate, Durodyne, Ward, Nexus, Radiant T-35m, and MEZ are approved as breakaway connections when installed as illustrated (see Figure 18).

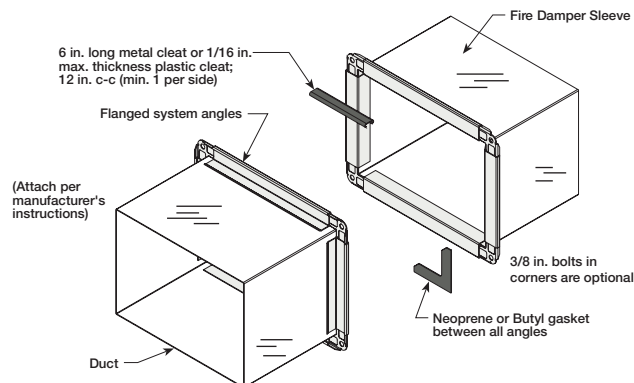


Figure 18

Proprietary Flange System Breakaway Connections

(TDC by Lockformer, TDF by Engle)

TDC and TDF systems are approved as breakaway connections when installed as described in the TDC or TDF addendum to the SMACNA Duct Construction. Standard 6 in. (152mm) metal clip may be used with spacing as shown in diagram (see Figure 19 & 20). 3/8 in. (9.5mm) metal bolts and nuts may be used to fasten together corner pieces (see Figure 21).

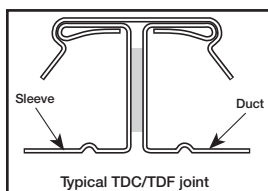


Figure 19

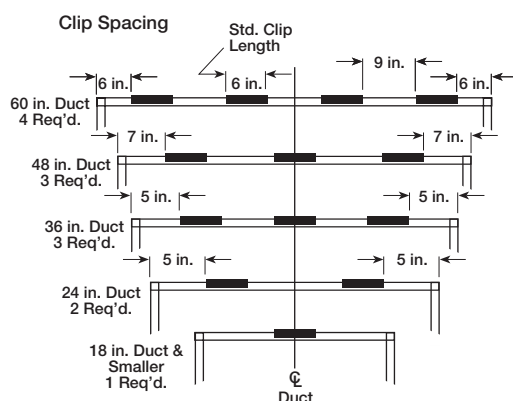


Figure 20

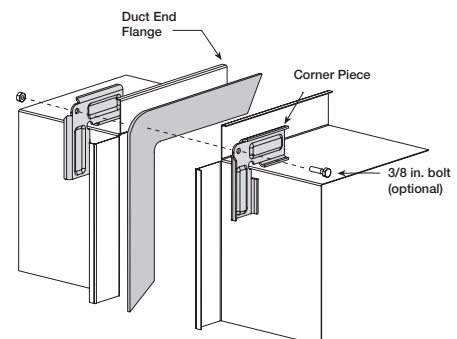


Figure 21

Actuator and Temperature Response Device Connections

Actuator Connections

Electrical and/or pneumatic connections to damper actuators should be made in accordance with wiring and piping diagrams developed in compliance with applicable codes, ordinances and regulations (see **Electrical Guidelines**).

Temperature Response Device Connections

RRL - The RRL (resettable link device) incorporates a single thermostat. When the thermostat temperature is reached the sensor interrupts power to the actuator and the actuator's spring return mechanism causes the damper to close. Refer to **Figure 22** for wiring of the RRL thermostat.

OCI - The OCI (open or closed indicator) option contains two single pole single throw switches used to indicate the damper blade position. The switches provide a positive open and closed signal and can be used in conjunction with remote indicator lights. Refer to **Figure 23** for wiring of the OCI option.

RRL /OCI - The RRL/OCI performs the function of an RRL and OCI (see description above). Refer to **Figure 24** for wiring of the RRL/OCI option.

TOR - The TOR (temperature override device) option incorporates two thermostats with fixed settings (usually 165°F [74°C] and 350°F [177°C]). The primary sensor (the sensor with the lower temperature setting) can be bypassed by an external contact closure allowing the damper to reopen until the secondary temperature is reached (the sensor with the higher temperature setting). See **Figure 25**.

The TOR assembly contains two single pole single throw switches used to indicate damper blade position. The switches provide a positive open and closed signal and can be used in conjunction with remote indicator lights. See **Figure 25** for wiring of the TOR thermostats and indicator switches.

If either the TOR or the RRL is ordered with a pneumatic actuator, an EP switch is required with an appropriate electric power circuit to allow the electric thermostat to control the pneumatic actuator.

Ratings (Figure 22, 23, 24, & 25)

Integral Switch Type: Single Pole, double throw

Electrical Capacity: 10 Amps, 1/3 hp, 120 or 240 Vac

1/2 Amp, 125 Vdc;

1/4 Amp 250 Vdc

5 Amps, 120 Vac "L" (lamp load)

1.0 Amps, 24 Vac

1.5 Amps, 24 Vdc

Temperature Limit: 165° F (standard primary sensor)

212° F (optional primary sensor)

250° F (secondary sensor)*

350° F (secondary sensor)*

* based on actuator temperature rating

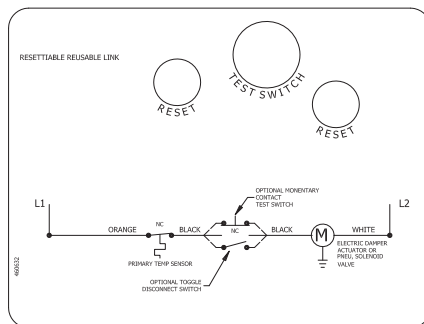


Figure 22: RRL Wiring

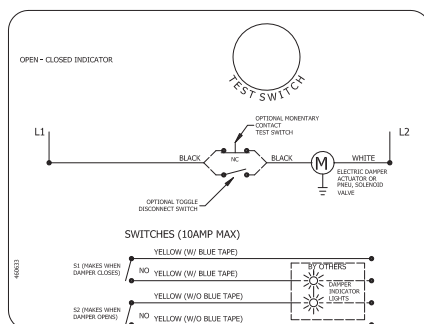


Figure 23: OCI

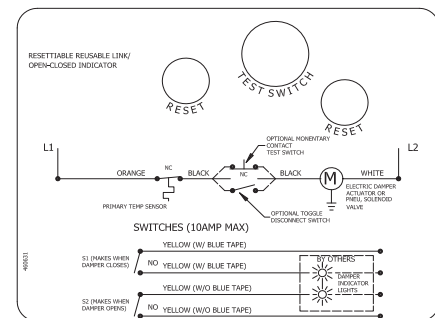


Figure 24: RRL/OCI

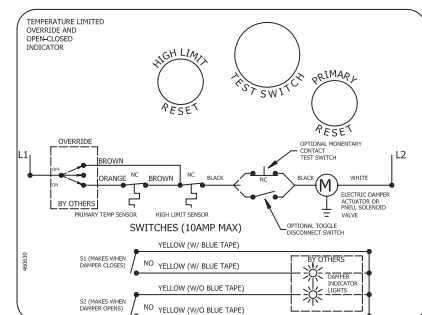


Figure 25: TOR

Damper Maintenance

Dampers do not typically require maintenance as long as they are kept dry and clean. If cleaning is necessary, use mild detergents or solvents. If lubrication is desired for components such as axle bearings, jackshaft bearings and jamb seals, do not use oil-based lubricants or any other lubricants that attract contaminants such as dust.

Dampers and their actuator(s) must be maintained, cycled, and tested a minimum in accordance with:

- The latest editions of NFPA 80, 90A, 92A, 92B, 101, 105, UL864, AMCA 503-03 and local codes.
- Actuator manufacturer recommendations.

Damper Troubleshooting

The following is a possible cause and correction list for common concerns with the dampers.

Symptom	Possible Cause	Corrective Action
Damper does not fully open and/or close	Frame is 'racked' causing blades to bind on jamb seals	Adjust frame such that it is square and plumb
	Actuator linkage loose	Close damper, disconnect power, adjust and tighten linkage
	Defective motor	Replace
	Screws in damper linkage	Damper installed too far into wall. Move out to line as designated on damper label
	Contaminants on damper	Clean with a non-oil based solvent (see Damper Maintenance)
RRL or TOR sensor tripped	Heat	Push reset button located on backside of RRL or TOR
Damper does not operate	No power supplied to the actuator	Add power supply



Our Commitment

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Specific Greenheck product warranties can be located on greenheck.com within the product area tabs and listed in the Library under Warranties.



Phone: (715) 359-6171 • Fax: (715) 355-2399 • E-mail: gfcinfo@greenheck.com • Website: www.greenheck.com

Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage!

These instructions apply to 1½ hour rated fire and combination fire smoke dampers mounted in: 1) masonry, block, or stud walls and 2) concrete floors or ceilings. Specific requirements in these instructions are mandatory. Dampers must be installed in accordance with these instructions to meet the requirements of UL 555 and/or UL 555S.

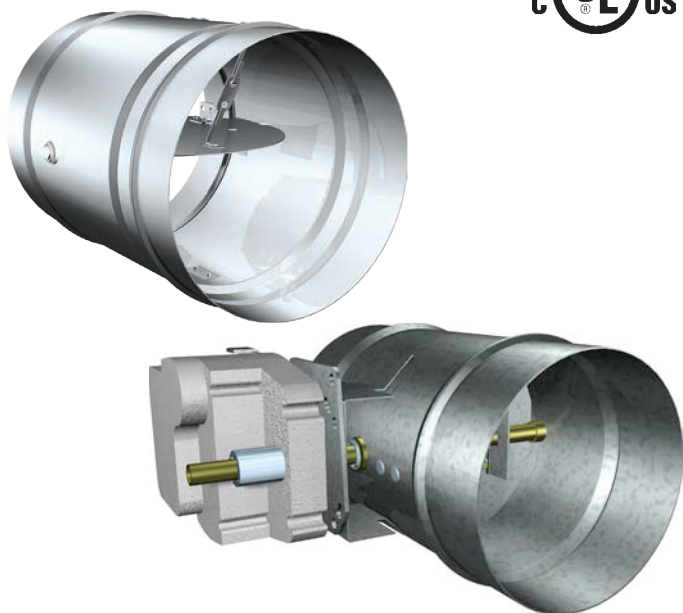


Table of Contents

General Information	2
Pre-Installation Guidelines	2
Electrical Guidelines	2
Installation	3-7
Preparation of Openings	3
Clearances Required Between Damper Sleeves and Wall/Floor Openings	4
Inserting Damper Into Wall/Floor Openings.	4
Maximum Size Tables	4
Securing the Damper/Sleeve Assembly to Wall/Floor Openings	5
Duct to Sleeve Connection	5
Actuator & Temperature Response Device Connection	6
Blade Orientation	7
Maintenance	7
Troubleshooting	7

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 (38°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.

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

General Information

“UL CLASSIFIED (see complete marking on product)”

“UL CLASSIFIED to Canadian safety standards (see complete marking on product)”

Standard 555 & 555S (Listing #R13317)

Installation Supplements only available on greenheck.com

- Steel Deck Supplement

Electrical Guidelines

Electrical Guidelines

All wiring shall be done in accordance with the National Electrical Code ANSI/NFPA-70 latest edition, any local codes that may apply, and wiring diagrams developed in compliance with the job or project design and specifications.

Important!

Electrical input may be needed for this equipment. This work should be performed by a qualified electrician. Verify power before wiring actuator. Greenheck is not responsible for any damage to, or failure of the unit caused by incorrect field wiring. To avoid causing death or serious bodily harm to building occupants, follow all instructions carefully. Dampers must close completely to preserve the integrity of the fire smoke separation.

Pre-Installation Guidelines

The following items will aid in completing the damper installation in a timely and effective manner.

- 1) Check the drawings for proper damper locations within the building. Visually inspect the damper for damage and verify that the Reusable Resettable Link (RRL) is in place and has not activated if provided. These electric links have a button for resetting. Visually inspect the link to verify its not missing or broken. Replace link as necessary.
- 2) Lift or handle damper using sleeve or frame. Do not lift damper using blades or actuators.
- 3) Damper has label on outside of sleeve indicating a ‘No Screw’ area. Do not install screws into this area as screws may interfere with unexposed blade linkage and prevent damper blades from opening and/or closing.
- 4) Damper has label indicating position of damper and sleeve assembly in the wall. Install accordingly to comply with manufacturer’s appropriate UL Classification file number.
- 5) Damper must be installed into duct or opening square and free of twist or other misalignment. Out of square, racked, twisted or misaligned installations can cause excessive leakage and/or torque requirements to exceed damper/actuator design.
- 6) Damper and actuator must be kept clean 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) Mortar dust
 - b) Drywall dust
 - c) Firesafing materials
 - d) Wall texture
 - e) Paint overspray
- 7) Damper should be sufficiently covered as to prevent overspray if wall texturing or spray painting will be performed within 5 feet of the damper. Excessive dirt or foreign material deposits on the damper can cause excessive leakage and/or torque requirements to exceed damper/actuator design.
- 8) Caulking is not necessary, nor is it allowed, between the damper sleeve and the wall or floor opening (annular space). However, caulking may be applied to the retaining angles.
- 9) ACCESS: Suitable access (such that RRL’s and actuators can be maintained, 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. (Refer to NFPA 90A).
- 10) The Code Authority Having Jurisdiction (AHJ) must evaluate and provide approval of final installation where variations to these instructions are necessary.

Clearances Required Between Damper Sleeves and Wall/Floor Openings

Fire damper assemblies expand during periods of intense heat. Therefore, it is essential that openings in walls or floors be larger than the fire or combination fire smoke damper assembly to allow for this expansion. The wall/floor opening must be a minimum of 7/8 in. (22mm) larger than the outside diameter of the damper.

Maximum Size Table

Damper Model	Maximum Size
DFDR-510	24 in. (610mm)
FDR-510	
FSDR-511	
FSDR-512	
SEDFDR-510	
SEFSDR-511	
SSDFDR-510	
SSFDR-510	
SSFSDR-511	

Inserting Damper into Wall/Floor Openings

Insert the damper assembly into the prepared opening, to appropriate depth (see **Figure 3 & 4**).

Recommended maximum and minimum insertion depth can be exceeded if:

Special attention must be paid to ensure the following:

- 1) The $\varnothing$ (centerline) of the damper frame remains within the plane of the wall or floor
- 2) The sleeve does not extend more than 16 in. (406mm) beyond the wall or floor on the actuator side of the damper and 6 in. (152mm) on the side opposite the actuator. The sleeve may also extend up to 16 in. (406mm) beyond the wall or floor if the damper has a factory supplied access door.

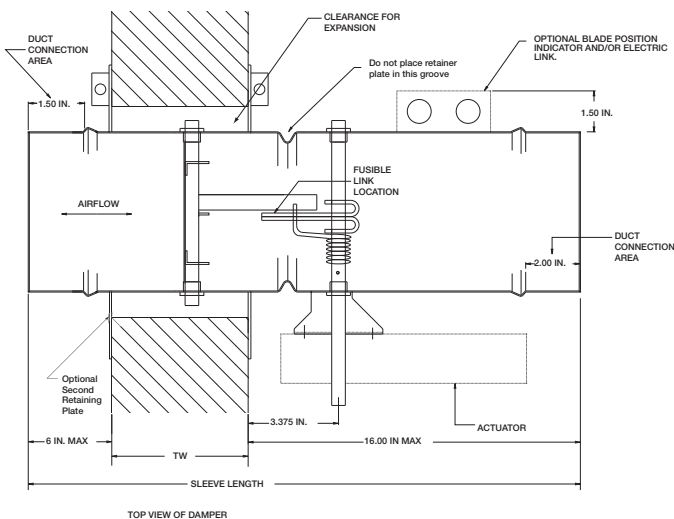


Figure 3: FSDR/SEFSDR/SSFSDR

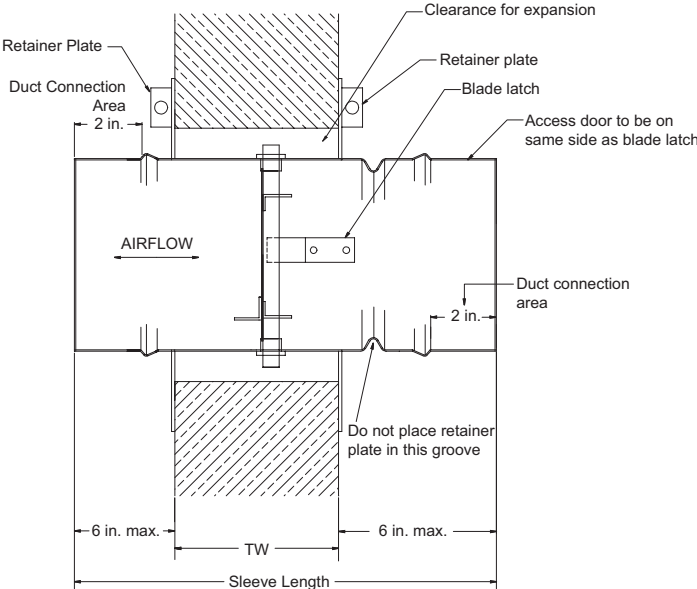


Figure 4: DFDR/FDR/SEDFDR/SSDFDR/SSFDR



Securing the Damper/Sleeve Assembly to Wall and Floor Openings

Damper assemblies must be installed in wall and floor openings using a single retaining plate on either side of the wall/floor or by using a retaining plate on both sides of the wall/floor. The use of a second retaining plate is provided with the dampers. A second retaining plate can be ordered as an option.

- The retaining plate(s) will open up for easy installation when the clamping screw is loosened. If necessary, remove the clamping screw and nut (see **Figure 5**).
- Position the retaining plate between the blade axle and the actuator shaft as shown in **Figure 3 & 4**. Do not place the retaining plate in the groove. **IMPORTANT:** The clamping mechanism should face away from the wall/floor.
- Place the damper and attached retainer plate into the wall/floor opening.
- If a second retaining plate is being used, secure it on the opposite side of the wall/floor.
- Verify position, blade orientation, and actuator clearance then tighten the retainer plate clamping screws.
- The retainer plate(s) must overlap the wall/floor opening a minimum of 1 inch (25mm).
- Secure the retainer plate(s) to the wall at the four corners of each plate when two retainer plates are used and also within $\frac{3}{4}$ in. (19mm) of the center of each side when one retainer plate is used. The following fasteners shall be used:
 - #8 or #10 screws of a length such that the screw engages the steel stud/track by $\frac{1}{2}$ in. (13mm)(steel framing).
 - #8 or #10 screws of a length such that screw engages the wood stud by $1\frac{3}{4}$ in. (44mm) (wood framing)
 - Steel anchors or self tapping concrete screws penetrating masonry or block by $1\frac{1}{4}$ in. (32mm).

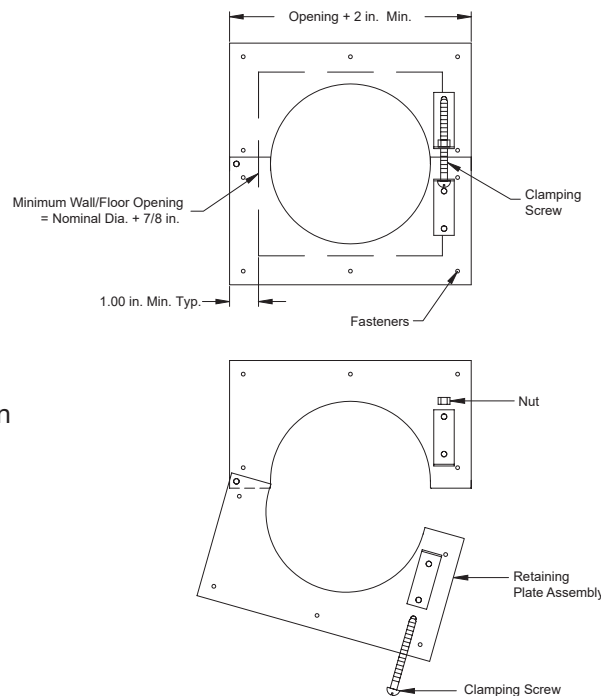


Figure 5: Retaining Plates

Duct to Sleeve Connections

Sleeve Gauge and Connection Type Requirements

Round duct connections to shall be attached with #8 or #10 sheet metal screws as follows:

- Ducts 22 in. (558mm) dia. and smaller shall have three screws.
- Ducts larger than 22 in. (558mm) dia. up to and including 24 in. (610mm) dia. shall have five screws.

Note: All connections described may have duct sealant, PA2084T duct sealant adhesive manufactured by Precision, DP1010 water base duct sealant manufactured by Design Polymetrics, Grey Pookie, Ductmate PROseal[®], or CL Ward S Seal applied in accordance with SMACNA recommendations.

Actuator and Temperature Response Device Connections

Actuator Connections

Electrical and/or pneumatic connections to damper actuators should be made in accordance with wiring and piping diagrams developed in compliance with applicable codes, ordinances and regulations (see **Electrical Guidelines**).

Temperature Response Device Connections

RRL - The RRL (resettable link device) incorporates a single thermostat. When the thermostat temperature is reached, the sensor interrupts power to the actuator and the actuator's spring return mechanism causes the damper to close. Refer to **Figure 6** for wiring of the RRL thermostat.

OCI - The OCI (open or closed indicator) option contains two single pole single throw switches used to indicate the damper blade position. The switches provide a positive open and closed signal and can be used in conjunction with remote indicator lights. Refer to **Figure 7** for wiring of the OCI option.

RRL /OCI - The RRL/OCI performs the function of an RRL and OCI (see description above). Refer to **Figure 8** for wiring of the RRL/OCI option.

TOR - The TOR (temperature override device) option incorporates two thermostats with fixed settings (usually 165°F [74°C] and 350°F [177°C]). The primary sensor (the sensor with the lower temperature setting) can be bypassed by an external contact closure allowing the damper to reopen until the secondary temperature is reached (the sensor with the higher temperature setting). See **Figure 9**.

The TOR assembly contains two single pole single throw switches used to indicate damper blade position. The switches provide a positive open and closed signal and can be used in conjunction with remote indicator lights. See **Figure 25** for wiring of the TOR thermostats and indicator switches.

If either the TOR or the RRL is ordered with a pneumatic actuator, an EP switch is required with an appropriate electric power circuit to allow the electric thermostat to control the pneumatic actuator.

Ratings (Figure 6, 7, 8, & 9)

Integral Switch Type: Single Pole, double throw

Electrical Capacity: 10 Amps, 1/3 hp, 120 or 240 Vac

½ Amp, 125 Vdc;

¼ Amp 250 Vdc

5 Amps, 120 Vac “L” (lamp load)

1.0 Amps, 24 Vac

1.5 Amps, 24 Vdc

Temperature Limit: 165° F (standard primary sensor)

212° F (optional primary sensor)

250° F (secondary sensor)*

350° F (secondary sensor)*

* based on actuator temperature rating

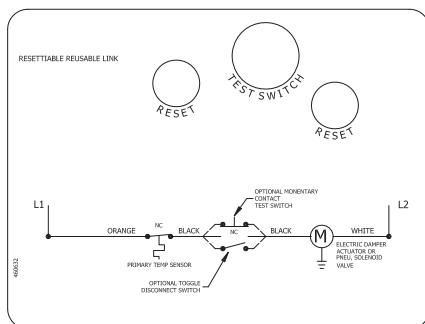


Figure 6: RRL Wiring

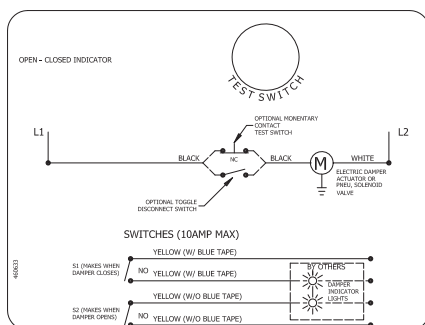


Figure 7: OCI

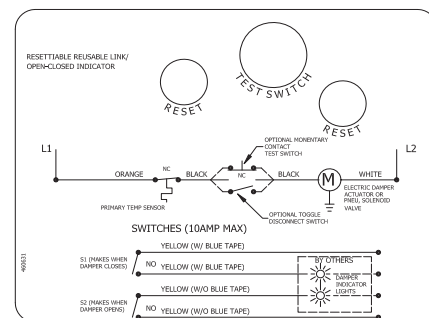


Figure 8: RRL/OCI

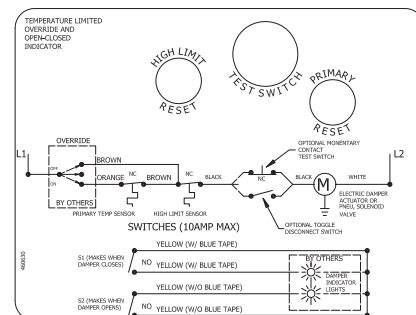
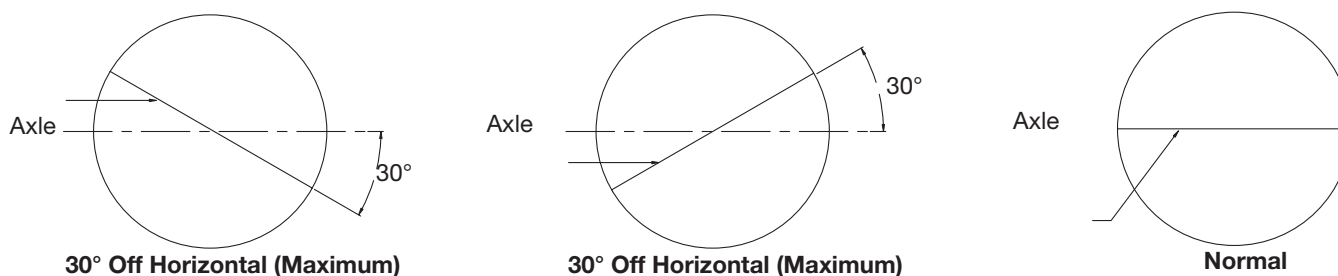


Figure 9: TOR

Blade Orientation



Damper Maintenance

Dampers do not typically require maintenance as long as they are kept dry and clean. If cleaning is necessary, use mild detergents or solvents. If lubrication is desired for components such as axle bearings, jackshaft bearings and jamb seals, do not use oil-based lubricants or any other lubricants that attract contaminants such as dust.

Dampers and their actuator(s) must be maintained, cycled, and tested a minimum in accordance with:

- The latest editions of NFPA 80, 90A, 92A, 92B, 101, 105, UL864, AMCA 503-03 and local codes.
- Actuator manufacturer recommendations.

Damper Troubleshooting

The following is a possible cause and correction list for common concerns with dampers.

Symptom	Possible Cause	Corrective Action
Damper does not fully open and/or close	Frame is 'racked' causing blades to bind on jamb seals	Adjust frame such that it is square and plumb
	Actuator linkage loose	Close damper, disconnect power, adjust and tighten linkage
	Defective motor	Replace
	Screws in damper linkage	Damper installed too far into wall. Move out to line as designated on damper label
	Contaminants on damper	Clean with a non-oil based solvent (see Damper Maintenance)
RRL or TOR sensor tripped	Heat	Push reset button located on backside of RRL or TOR
Damper does not operate	No power supplied to the actuator	Add power supply

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



Specific Greenheck product warranties are located on greenheck.com within the product area tabs and in the Library under Warranties.

