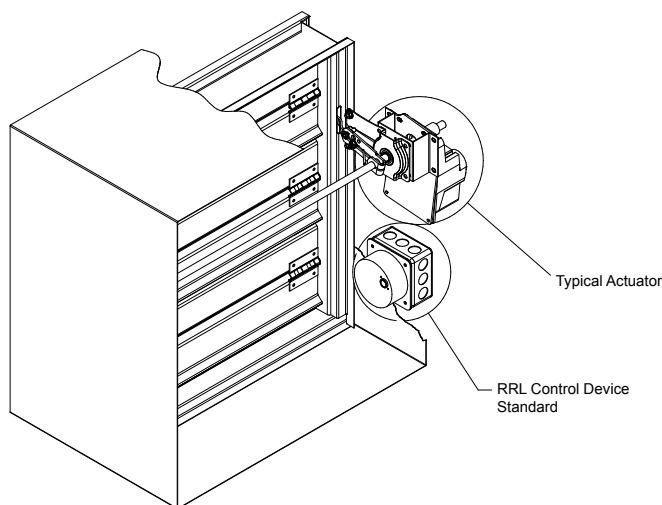


Installation, Operation and Maintenance Instructions



FSD-XXX, SEFSD-XXX, SSFSD-XXX, DFD-XXX, SEDFD-XXX, and CFSD-XXX Series Dampers are intended for installation in accordance with combination fire smoke damper requirements established by:

National Fire Protection Association

NFPA Standards 80, 90A, 92A, 92B, 101, & 105

BOCA National Building Codes

ICBO Uniform Building Codes

IBC International Building Codes

SBCCI Standard Building Codes

New York City (MEA listing #260-91-M)

California State Fire Marshal

(Listing #3225-0981:103) & (Listing #3230-0981:104) - FSD models;
(Listing #3225-0981:103) - DFD models;
(Listing #3230-0981:105) & (Listing 3225-0981:106) - CFSD models;
(Listing #3225-0981:109) & (Listing 3230-0981:110) - SSFSD models

Installation Supplements

Refer to the appropriate Greenheck installation supplements for special requirements:

- Metal Stud in Shaftwall
- Metal Stud in Drywall
- Wood Stud in Shaftwall
- Smoke Detector
- No Flow Smoke Detector
- Tunnel Corridor
- Single Side Retaining Angle
- Grille Installation
- Field Installed Sleeve
- Quick Connect Breakaway Connections
- Sealant Supplement
- Fire Resistant Ventilated Duct Assembly
- Drive Slip Breakaway Connection
- Concrete Floor with Steel Deck
- Sleeve Extension
- Open or Close Indicator
- Resettable Link

"UL CLASSIFIED (see complete marking on product)"

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

UL Standard 555 & 555S (Classification #R13317)

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).

Warranty

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of one year from the purchase date. Any units or parts which prove to be defective during the warranty period will be repaired or replaced at our option. Greenheck shall not be liable for damages resulting from misapplication or misuse of its products. Greenheck will not be responsible for any installation or removal costs. Greenheck will not be responsible for any service work or backcharges without prior written authorization.

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.

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.

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Pre-Installation Guidelines

The basic intent of a proper installation is to secure the fire or fire smoke damper in, not to, the opening in such a manner as to prevent distortion and disruption of damper operation. This is accomplished by allowing the fire or fire smoke damper in rated separation openings to expand and for the connecting duct to separate in the event of the collapse of the hanging system. 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 Reusable Resettable Link (RRL) is in place or has not activated. Never install a fire damper without the proper UL approved RRL in place. (RRL is standard control option. These electric links have a button for resetting.) If damper is furnished with fusible link, 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. 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.
- 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 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.

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.

Safety Caution!

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.

Installation - Failure to follow these instructions will void all warranties.

These instructions apply to 1½ and 3 hour rated combination fire smoke dampers mounted (blades must be horizontal) 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 UL 555S. The installation of the damper and all duct connections to the damper sleeve shall conform to the latest editions of NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems, and the SMACNA Fire, Smoke and Radiation Damper Installation Guide, and UL Classifications R13317.

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

1. CLEARANCES REQUIRED BETWEEN FIRE DAMPER SLEEVES AND WALL/FLOOR OPENINGS

Fire damper and sleeve assemblies expand during periods of intense heat. Therefore, it is essential that openings in walls or floors be larger than the fire/smoke damper and sleeve assembly to allow for this expansion. Minimum clearances required between the outside of fire damper sleeve assemblies and wall/floor openings are:

- Galvanized steel fire dampers and sleeves: ⅛ in. per foot (3mm per .3 m) of damper width and ⅛ in. per foot (3mm per .3 m) height with a minimum clearance of ¼ in. (6mm), maximum of 1½ in. (38mm).

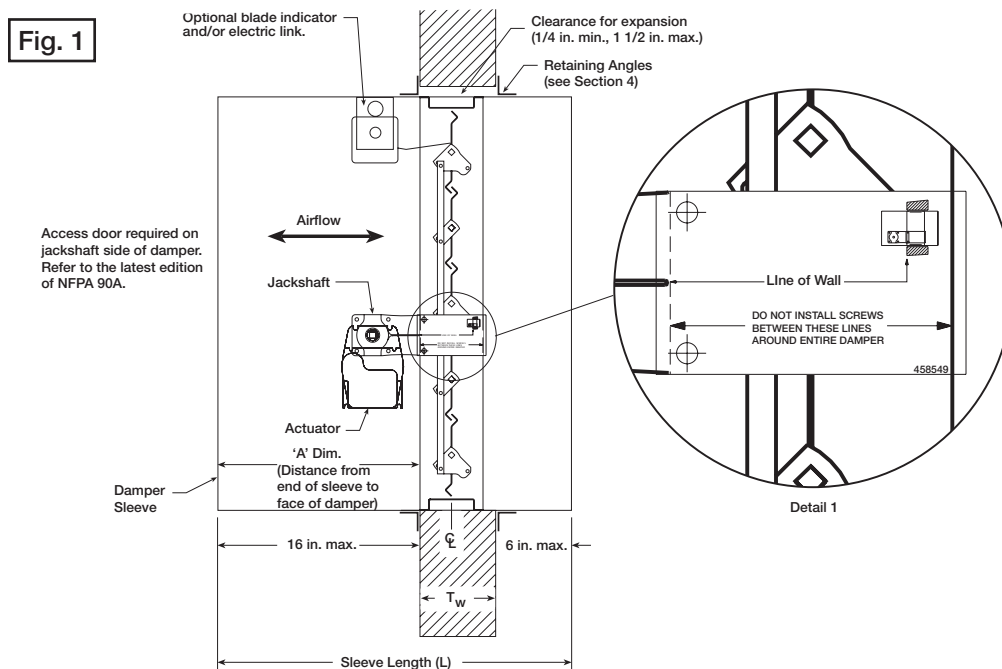
Recommended clearances, for width and/or height dimensions of:

- 48 in. (1219mm) or less: ½ in. (13mm) clearance
 - More than 48 in. (1219mm) and 96 in. (2438mm) or less: 1 in. (25mm) clearance
 - More than 96 in. (2438mm): 1½ in. (38mm) clearance
- Stainless steel fire/smoke dampers and stainless steel or galvanized sleeves: ⅜ in. per foot (5mm per .3 m) of damper width and height with a minimum clearance of 1/4 in. (6mm), maximum of 2 in. (51mm).

Recommended clearances, for width and/or height dimensions of:

- 48 in. (1219mm) or less: ¾ in. (19mm) clearance.

These are total clearances (ignoring fastener heads) and do not need to be equally spaced around the damper. Refer to Section 4 and Figure 6 for additional installation considerations.



Dampers may be mounted either vertically or horizontally. Blade axis must always be horizontal.

Example:

A 12 in. x 12 in. (305mm x 305mm) will require a minimum clearance of 1/4 in. (6mm) width and 1/4 in. (6mm) on height

A 36 in. x 12 in. (914mm x 305mm) damper will require a minimum clearance of 1/2 in. (13mm) on width and 1/4 in. (13mm) on height.

2. SLEEVE LENGTH AND WALL THICKNESS

Insert the sleeved damper assembly into the prepared opening, to appropriate depth (refer to label on outside of sleeve for location of damper in wall; see Page 3, Dimension A and Detail 1, **Fig. 1**).

Recommended maximum and minimum insertion depth can be exceeded if:

- 1) The operation of the damper is not impeded and
- 2) The Q_c of the damper frame remains within the plane of the wall and
- 3) Attachments made through the retaining angle do not penetrate the 'No Screw' area designated on the damper sleeve.

IMPORTANT SAFETY DANGER! : To avoid causing death or serious bodily harm to building occupants, do not penetrate the 'No Screw' area designated on the damper sleeve or the damper may not close properly.

The sleeve may extend a maximum of 16 in. (406mm) beyond the wall or floor on the actuator side of the damper and a maximum of 6 in. on the opposite side. Recommended standard sleeve lengths for various wall thicknesses are:

Wall Thickness Dimension (T_w)	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)

3. DUCT TO SLEEVE CONNECTIONS

Dampers are supplied with sleeves and actuators from the factory and can be installed without the need for additional field installed sleeves.

Gauge of factory furnished sleeve determines the type of duct to sleeve connections required (see table below). Any duct connection other than the breakaway connections described on page 7 are considered rigid. Factory furnished duct collars, type R and O, are also considered breakaway (see **Fig. 2**).

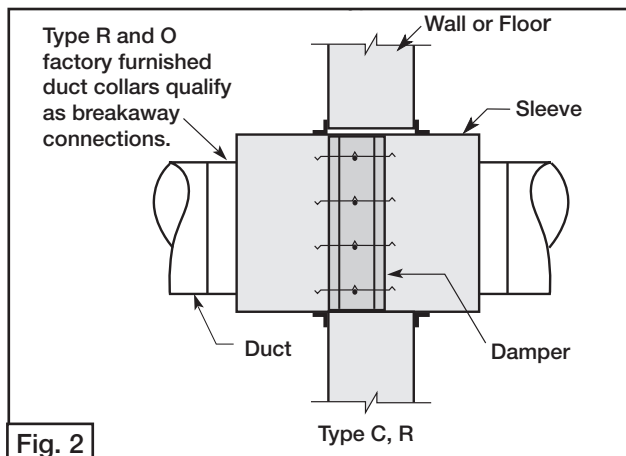


Fig. 2

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. width 24 in. (610mm) diameter	Rigid only
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 page 7 for additional information on breakaway sleeve connections. Sleeve thickness must not be less than the gauge of the connecting duct. UL Standard 555 requires all ducts to terminate at fire damper sleeves.		

4. SECURING THE DAMPER/SLEEVE ASSEMBLY TO WALL AND FLOOR OPENINGS (for single side retaining angle instructions, see supplements)

Damper/sleeve assemblies must be installed in wall and floor openings using retaining angles on at least one side of the wall or floor as described below:

- Retaining angles must be a minimum of 16 gauge (1.5mm) steel and have a minimum of 1½ in. x 1½ in. (38mm x 38mm) legs.
- 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, and 6 in. (152mm) O.C. for openings 80 in. W x 50 in. H (2032mm x 1270mm), 50 in. W x 72 in. H (1270mm x 1829mm), and 40 in. W x 72 in. H (1016mm x 1829mm) or less. The angles must be attached to all 4 sides of the sleeve. Ensure that attachment device does not interfere with the operation of the damper and the free movement of the damper blades. The angles need not be attached to each other at the corners. Do not secure the retaining angle to the fire separation (see **Fig. 3**).

- Retaining angles must completely cover the clearance space between the damper and the wall/floor opening, plus overlap the wall/floor a minimum of 1 in. (25mm). This coverage includes all corners.
- Retaining angles should not be fastened to the wall/floor material. The angles should only sandwich the wall/floor and allow for damper expansion during periods of intense heat.

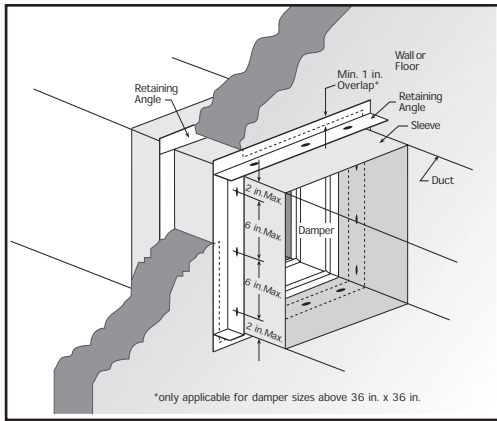


Fig. 3 Both vertical and horizontal damper installations are typified by these drawings.

5. 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**).

6. INSTALLING MULTIPLE DAMPER 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).

Two section high dampers require reinforcement using a 14 gauge (2mm), 5 in. (127mm) wide mullion as shown in **Fig. 4** below, or two individually sleeved units stacked vertically, shown below in **Fig. 5**. When using two individually sleeved units, the sleeve acts as the mullion, therefore no mullion is required.

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 minimum 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.

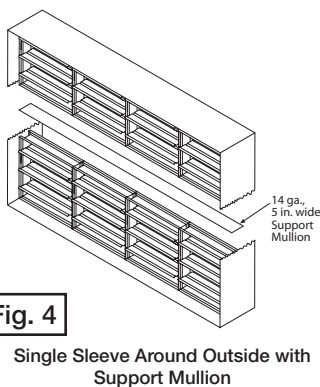


Fig. 4

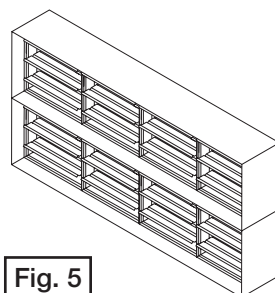


Fig. 5

Two Individually Sleeved Units with No Mullions

Horizontal Mount

Damper Model	Maximum Single Section Size	Maximum Overall Size for Multi-Section Dampers
CFSD-211, 212	24 x 24	NA
DFD-210	36 x 36 or 32 x 50	64 x 50
DFD-230	36 x 36 or 32 x 48	64 x 48
DFDAF-310	32 x 50	96 x 50
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-231	36 x 36 or 32 x 48	72 x 48
FSD-311, 311M, 312, 312M	32 x 50	96 x 50
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	Maximum Overall Size for Multi-section Dampers
DFD-210	36 x 36 or 32 x 50	64 x 50
DFD-230	36 x 36 or 32 x 50	64 x 48
DFDAF-310	32 x 50	96 x 50
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
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
FSD-331	32 x 36 or 30 x 48	120 x 96

NOTE: FSD model dampers fitted with a fusible link closure device are limited to single section sizes. Dampers with a fusible link and spring assembly closure device may not be used for multiple section applications.

7. CONNECTION AND OPERATION OF TEMPERATURE RESPONSE DEVICES (RRL STANDARD, OCI OPTION, AND TOR OPTION)

RRL - Dampers will be supplied with a thermostat-type temperature response device, as a standard. The device is a RRL (resettable link device), which only incorporates one thermostat and therefore the damper remains closed as soon as its sensor temperature is reached. The RRL does not contain blade indication switches. Refer to **Fig. 6** for wiring of the RRL thermostat.

OCI - The OCI (open or closed indicator) option contains a single pole, double throw switch used to indicate the damper blade position. The switch provides a positive open or closed signal when used in conjunction with remote indicator lights. Refer to **Fig. 7** for wiring of the 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 electrical signal allowing the damper to reopen until the temperature reaches the setting of the secondary sensor (the sensor with the higher temperature setting). See **Fig. 8**.

When the temperature of the secondary sensor is exceeded the damper closes and remains closed thereafter.

The TOR assembly also contains a single pole, double throw switch used to indicate damper blade position. The switch provides a positive open or closed signal when used in conjunction with remote indicator lights. See **Fig. 8** 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.

PRV - The PRV (pneumatic relief valve) option is heat responsive device used with pneumatic actuators. This can be used in place of EP switch where a RRL is used. The PRV activates when temperature in excess of the temperature of the fusible link are detected. When the fusible link melts, air from the actuator is exhausted to close the dampers. Pneumatic actuators are to be piped per local code.

RATINGS (Fig. 6, 7 & 8)

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

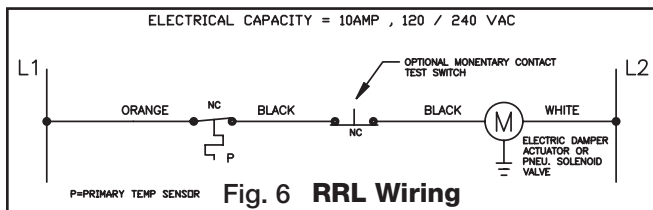


Fig. 6 RRL Wiring

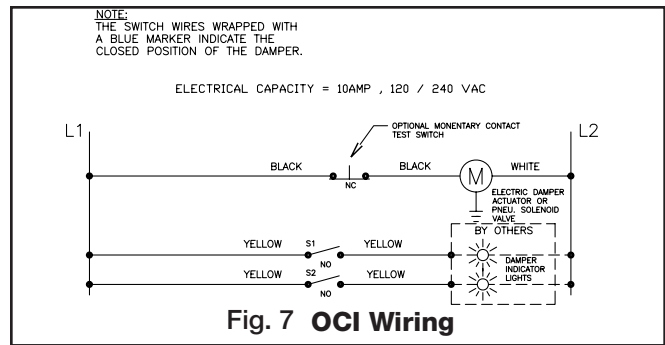


Fig. 7 OCI Wiring

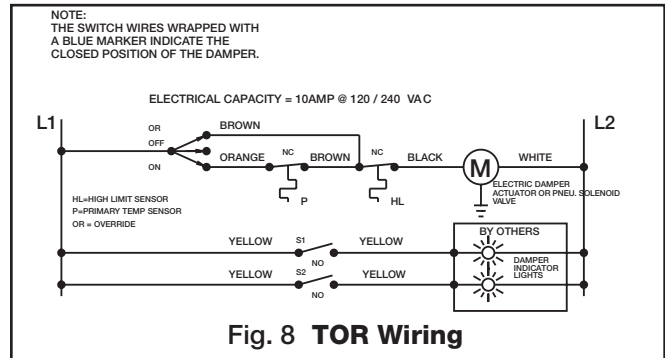


Fig. 8 TOR Wiring

8. Recommended Preparation of Openings in Wood and Metal Stud Walls

- Frame wall openings as shown below (see **Fig. 9 & 10**).
- Double vertical studs are not required for openings 36 in. x 36 in. (914mm x 914mm) or smaller.
- Gypsum wall board must be fastened 12 in. (305mm) on center to all stud and runner flanges surrounding opening (see **Fig. 11**).
- All construction and fasteners must meet the requirements of the appropriate wall design (See UL Fire Resistance Directory) and/or local codes.

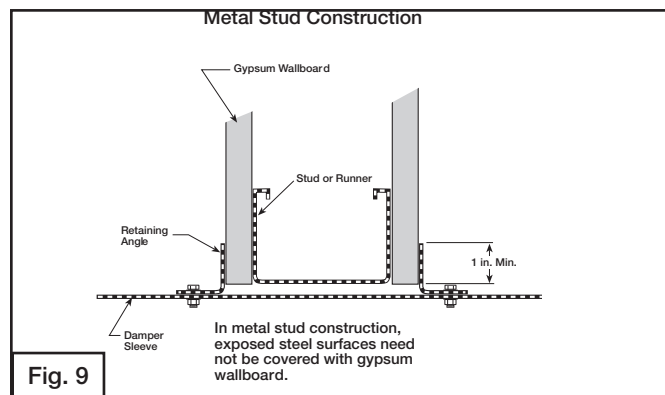


Fig. 9

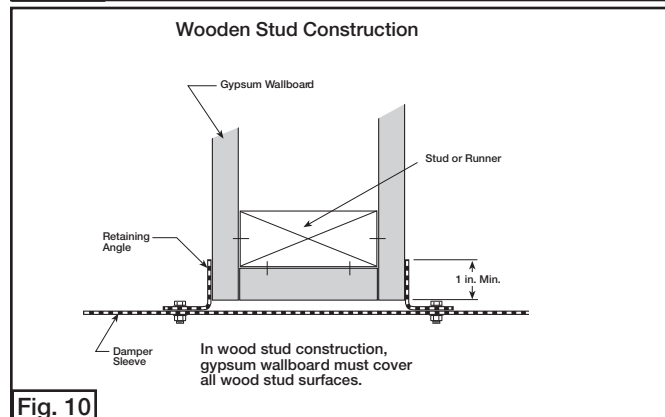


Fig. 10

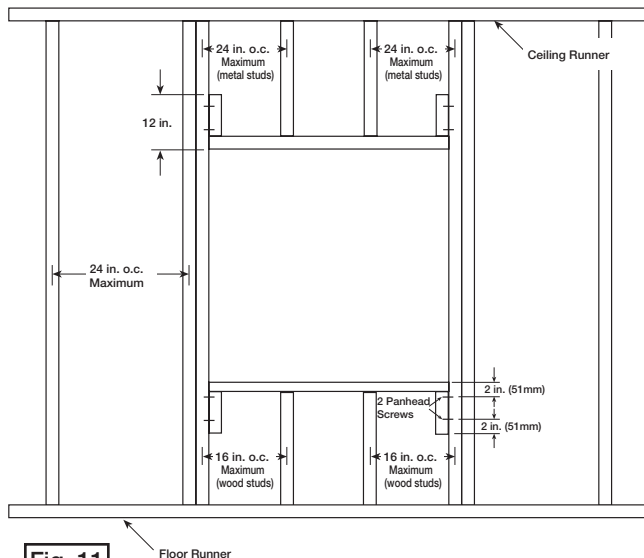


Fig. 11

9. BREAKAWAY CONNECTIONS

Traditional Breakaway Style Transverse Joints

Transverse joints illustrated at right have always been approved as breakaway connections. SMACNA testing has also approved the following variations as breakaway connections.

- The breakaway connections shown (Fig. 13) can be applied with maximum of two #10 (19mm) sheet metal screws on each side and on the bottom located in the center of the slip pocket and penetrating both sides of the slip pocket.
- Transverse joints illustrated can be applied as top and bottom joints with Drive Slip - side joints in duct heights up to 20 inches (508mm) See Fig. 12.

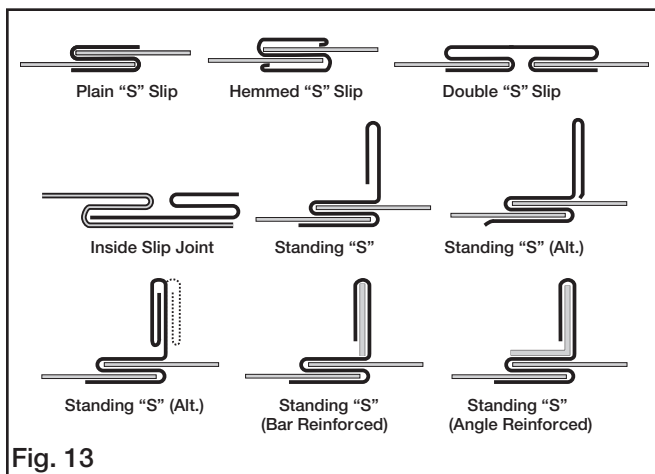


Fig. 13

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 to 22 in. (558mm) wide (or dia.) and smaller 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.

NOTE: All breakaway connections described may have duct sealant applied, PA2084T duct sealant adhesive manufactured by Precision, DP1010 water base duct sealant manufactured by Design Polymetrics, or Grey Pookie in accordance with SMACNA recommendations.

Manufactured Flanged System Breakaway Connections

Flanged connection systems manufactured by Ductmate, Ward, and Nexus are approved as breakaway connections when installed as illustrated (Fig. 14).

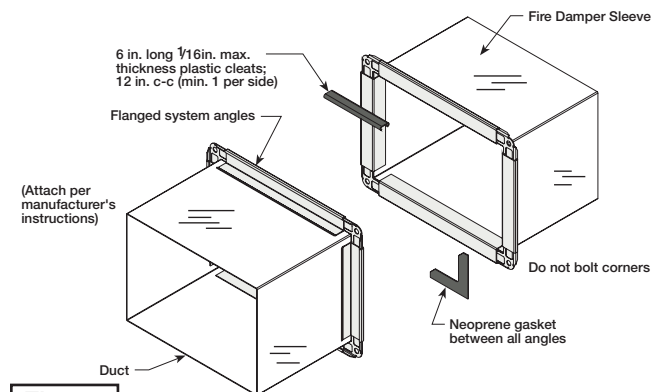


Fig. 14

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 Fig. 15 & 16). 3/8 in. (9.5mm) metal bolts and nuts may be used to fasten together corner pieces. (see Fig. 17)

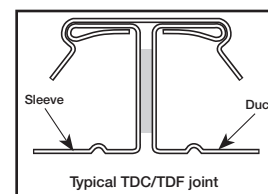


Fig. 15

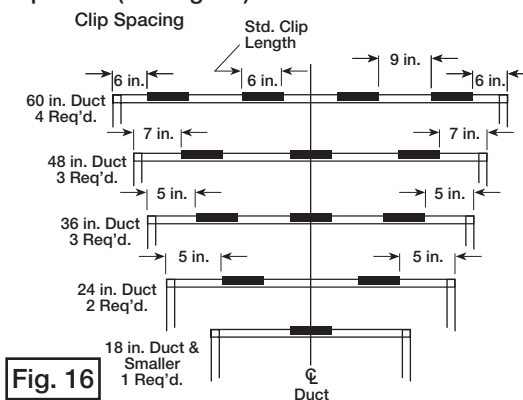


Fig. 16

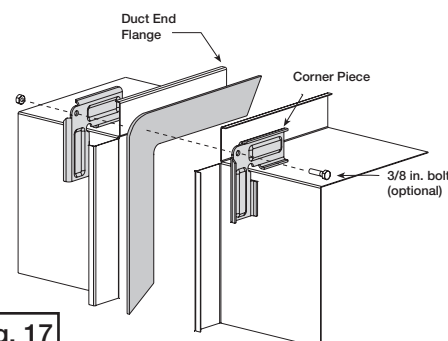


Fig. 17

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

