McGill AirFlow Corporation

An enterprise of United McGill Corporation - Founded in 1951

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Rectangular-k27® Duct and Fittings Dimensions

McGill AirFlow Corporation has a complete line of double-wall, insulated, rectangular duct and fittings. Each piece is constructed of an inner liner (either perforated or solid metal) surrounded by a layer of fiberglass insulation and covered by a solid metal pressure shell. The insulation is available in 1-, 2-, and 3-inch standard thicknesses that meet the thermal and acoustical performance requirements found in most HVAC systems.

Table 1 - Rectangular-k27 - Available Materials, and Thicknesses

Construction[1,2]	Materials[3,4]	Thicknesses
Rectangular-k27 (Outer Shell)	Galvanized Steel	28-18 gauge[5]
	Stainless Steel	26-22 gauge
	Aluminum	0.032-0.050 inch
Rectangular-k27 (Inner shell)	Galvanized Steel	24-20 gauge
	Stainless Steel	24-20 gauge
	Aluminum	0.040-0.050 inch

1. Both outer and inner shells incorporate Pittsburgh Lockseam construction and TDC™ end connectors. Ductwork is fully assembled with a finished length of 56 1/4 inches or 68 1/4 inches.
2. Fully welded outer shells are available on special order.
3. Outer and inner shell material type can be varied when using steels. If aluminum is required, both outer and inner shells must be aluminum.
4. Standard duct and fitting inner liner is perforated, galvanized steel.
5. Standard rectangular duct is made on an automated coil line and is limited to the gauges shown in Table 1. Fittings and non-standard duct with the Pittsburgh Lockseam are available in heavier gauges. Galvanized steel fittings are available to 14 ga with the Pittsburgh Lockseam construction at some locations. Check with your local sales office for pricing and availability.

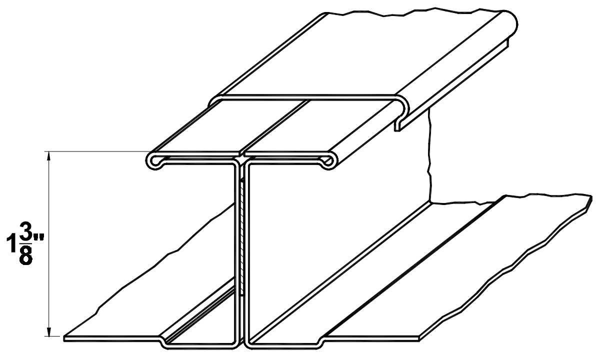
Table 2 - ASTM Material Specifications

Standard material	Type	ASTM Number
Galvanized Steel	—	A653, A924
Stainless Steel	304, 304L, 316, 316L	A167, A480
Nongalvanized Carbon Steel	18 - 28 gauge	A366, A568, A569
Aluminum	3003-H14	B209
Aluminized	Type 1	A463

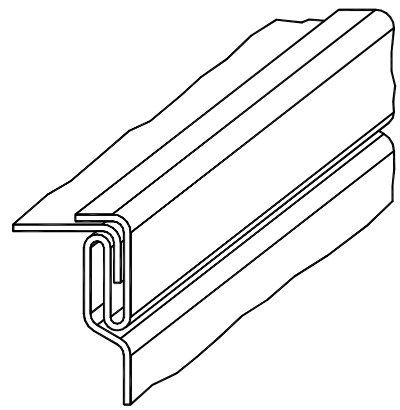
Other types of metal are available on special order.

Duct and Fitting Construction

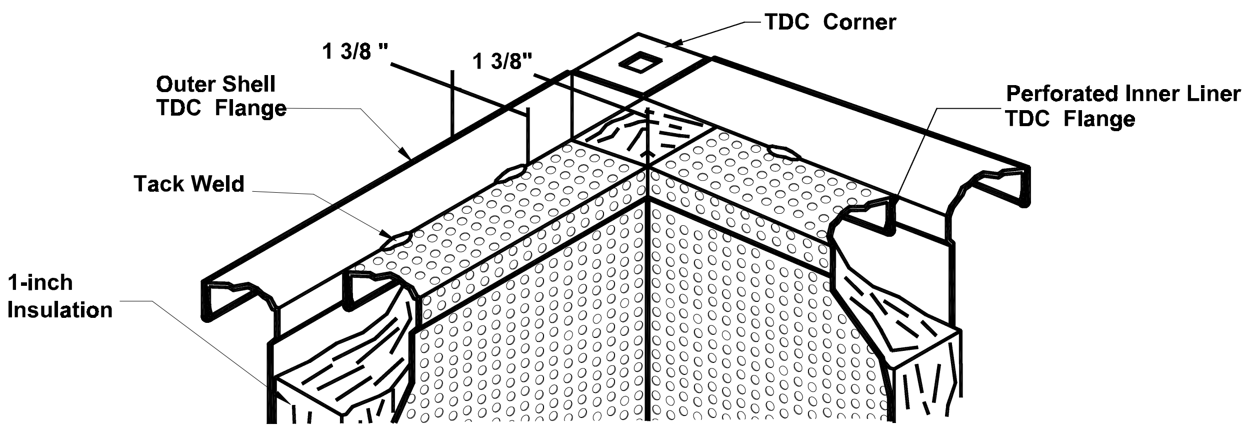
Lockformer TDC Duct Connector

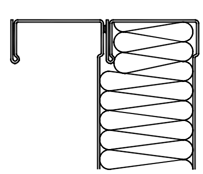


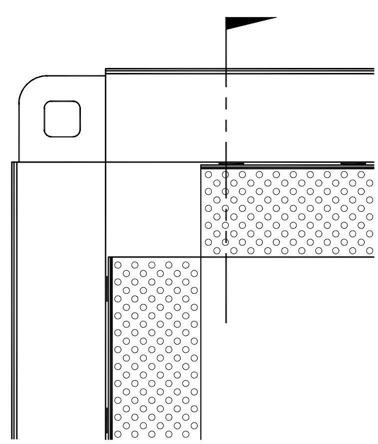
Pittsburgh Lockseam



Double-wall k27 Duct Construction







Note: For thicker insulation, additional nosing is tacked in place between the inner and outer TDC flange or the inner flange is left unformed and used as nosing.

#-Dimensioning

(All alphanumeric dimensions are in inches, all angles are in degrees)

W1	**-**	Main width, inner shell dimension (larger) as seen in plan view
H1	**-**	Main depth, inner shell dimension associated with W1
W2	**-**	Main width, inner shell dimension (smaller) as seen in plan view
H2	**-**	Main depth, inner shell dimension associated with W2
W3, W4	**-**	Branch widths, inner shell dimension as seen in plan view
H3, H4	**-**	Branch depths, inner shell dimension associated with W3 and W4
SA, SB, SC, SD	**-**	Fitting straight length extensions
RAD	**-**	Throat radius of the outer shell (W1 standard)
THR	**-**	Throat
V	**-**	Fitting length = 2*W1, standard
Z, LZ, RZ	**-**	Fitting offset in plan view
TD, TD3, TD4	**-**	Fitting offset in elevation (top down) [If TD = 0, then fitting will be flat on top {FOT}]
t	**-**	Insulation thickness
θ	**-**	Angular measurements (refer to specific drawings**)**

General Notes:

- Unless ordered otherwise, all Rectangular-k27 duct and fittings shall be constructed in accordance with the 1995 SMACNA *HVAC Duct Construction Standards and Addendum No. 1 dated November 1997.*

- Dimensions other than the standard dimensions shown are to be specified.

- Dimensions other than width and depth are held within a 1/4-inch tolerance.

- Width (W) and depth (H) dimensions are based on the orientation of the ductwork as shown in plan view of the drawing. The width is the dimension seen and the depth is the dimension unseen (refer to elevation details to see dimension). For example, a duct dimension of 24 x 12 in the plan view means W = 24 inches and H = 12 inches, whereas a duct dimension of 12 x 24 means W = 12 inches and H = 24 inches.

- W1 $\geq$ W2 regardless of the direction of airflow. Directional orientation of the fitting is determined when viewing the fitting from the W1 end.

- Duct dimensions are for the inner shell unless indicated otherwise on the drawings. The duct outer shell dimensions are 2 3/4 inches greater than the inner shell dimensions for 1-inch insulation thickness, in both width (W), and depth (H). The outer shell of double wall construction for 2- or 3-inch insulation thicknesses finish 2 times the insulation thickness larger (4-inch and 6-inch respectively).

- Insulation will be flexible or semi-rigid fiberglass with a maximum thermal conductivity of 0.27 Btu/hr · ft^2 · °F/inch.

- Round and flat oval taps are available in lieu of rectangular. Specify dimensions.

- Beading and crossbreaking are not required for double-wall construction.

Designations:

McGill AirFlow uses a designation system that simplifies product nomenclature. Most of our products can be accurately identified using a concise alphanumeric designator. Each character in the designation defines a characteristic of the product.

Example: KAT4TBR refers to a double-wall, rectangular (A), TDC end connectors(T), 4 in wg pressure class (4), reducing bullhead tee(TBR).

1st Character: **Wall Configuration - K**AT4TBR

K = Double-wall, insulated (1-inch standard)

2nd Character: **Shape -** K**A**T4TBR

A = Rectangular

3rd Character: **End Configuration -** KA**T**4TBR

T = TDC Transverse Duct Connector

4TH Character: **Pressure Class -** KAT**4**TBR

A = ± ½ inch wg
1 = ± 1 inch wg
2 = ± 2 inches wg
3 = ± 3 inches wg
4 = ± 4 inches wg
6 = ± 6 inches wg
0 = ± 10 inches wg
N = Nonstandard gauge

Notes:
1. When ordering duct or fittings, specify A, 1, 2, 3, 4, 6, 0, or N in the * position of the designation.
2. Pressure ranges listed for A, 1, 2, 3, 4, 6, and 0 are based on 1995 SMACNA Duct Construction Standards (galvanized only).
3. SMACNA is the Sheet Metal and Air Conditioning Contractors National Association.

5th and Subsequent Characters: **Product Type -** KAT4**TBR**

TBR = Reducing Bullhead Tee

Table 3 - Thickness/Weight Relationships of Standard Materials

Gauge	Galvanized and Paintable Galvanized Steel			Nongalvanized Carbon Steel			Stainless Steel (304 or 316)		
	Minimum Thickness (inches)	Nominal Thickness (inches)	Nominal Weight (lb/sq ft)	Minimum Thickness (inches)	Nominal Thickness (inches)	Nominal Weight (lb/sq ft)	Minimum Thickness (inches)	Nominal Thickness (inches)	Nominal Weight (lb/sq ft)
28	0.0157	0.0187	0.781	0.0129	0.0149	0.625	0.0136	0.0156	0.656
26	0.0187	0.0217	0.906	0.0159	0.0179	0.750	0.0158	0.0188	0.788
24	0.0236	0.0276	1.156	0.0209	0.0239	1.000	0.0220	0.0250	1.050
22	0.0296	0.0336	1.406	0.0269	0.0299	1.250	0.0273	0.0313	1.313
20	0.0356	0.0396	1.656	0.0329	0.0359	1.500	0.0335	0.0375	1.575
18	0.0466	0.0516	2.156	0.0438	0.0478	2.000	0.0450	0.0500	2.100
16	0.0575	0.0635	2.656	0.0548	0.0598	2.500	0.0565	0.0625	2.625
14	0.0705	0.0785	3.281	0.0697	0.0747	3.125	0.0711	0.0781	3.281
12	0.0994	0.1084	4.531	0.0986	0.1046	4.375	0.1000	0.1094	4.594
10	0.1292	0.1382	5.781	0.1285	0.1345	5.625	0.1286	0.1406	5.906

Table 3 (Cont.)

Aluminum 3003-H14		
Minimum Thickness (inches)	**Nominal Thickness (inches)**	**Nominal Weight (lb/sq ft)**
0.0230	0.025	0.356
0.0295	0.032	0.456
0.0365	0.040	0.570
0.0465	0.050	0.713
0.0595	0.063	0.898
0.0755	0.080	1.140
0.0855	0.090	1.283
0.0945	0.100	1.426
0.1195	0.125	1.782

Gauge/Reinforcement Tables:

The gauge of rectangular duct and fittings is based on the pressure classification, the major dimension of the outer shell, and the reinforcement (type and quantity) used per SMACNA (DCS) and Addendum No. 1 dated November 1997 for internal reinforcement. Tables 5 through 10 were developed for specific lengths of 5- or 6- feet. Tables 5 through 8 use angle iron external reinforcement. Tables 9 and 10 use tie rod internal reinforcement. A 'light gauge/heavy reinforcement' and a 'heavy gauge/light reinforcement' combination are given for external reinforcement for the 5- and 6- foot lengths. These tables are illustrative of the possible combinations of gauge/reinforcement and are not all inclusive. Other combinations may be more economical depending on size range, manufacturing capabilities, reinforcement availability and cost. In addition, shorter lengths may require less reinforcement. Fittings must have gauge/reinforcements similar to duct but are often shorter in length.

Table 4 - Double-wall, Rectangular Duct and Fittings Inner Shell Major Width/Gauge Relationships

Major Width	Duct or Fitting Thickness[1,2]	
Inner Shell Dimension (inches)	**Galvanized (gauge)**	**Aluminum (inches)**
3-72	24	0.040
73-96	22	0.050
97-120	20	0.063

1 Standard inner liner shells are fabricated with G-60, perforated steel unless the outer shell is aluminum. If the outer shell is aluminum, the inner liner shell must be aluminum as well.

2 The inner liner can be ordered as solid as well

Table 5 - Rectangular-k27 Light Gauge/Heavy Reinforcement for 5-Foot Joints Using External Angle Reinforcement

Maximum Outer Shell Major Axis (inches)	Pressure Classification (nominal 60-inch duct lengths)													
	±½ inch wg		±1 inch wg		±2 inch wg		±3 inch wg		±4 inch wg		±6 inch wg		±10 inch wg	
	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR
10	26		26		26		26		26		26	1R	26	1R
12	26		26		26		26		26		26	1R	26	1R
18	26		26		26		26	R1	26	1R	26	1R	24	1R
24	26		26		26		26	R1	26	1R	24	1R	22	1R
26	26		26		26		26	R1	26	2R	24	1R	22	1R
28	26		26		26	1R	26	R1	26	2R	22	1R	24	2R
30	26		26		26	1R	24	R1	26	2R	22	1R	24	2R
36	26		26	1R	26	1R	24	R1	26	2R	20	1R	22	2R
42	26		26	1R	24	1R	22	R1	24	2R	22	2R	20	2R1
48	26	1R	24	1R	22	1R	24	2R	24	2R	22	2R1	18	2R1
54	26	1R	24	1R	22	1R	24	2R	22	2R	20	2R1	18	2R1
60	24		24	1R	24	2R	22	2R	22	2R1	20	2R1	18	2R2
72	24	1R	22	1R	22	2R	22	2R1	20	2R1	18	2R1	18	3R2
84	22	1R	22	2R	22	2R1	20	2R1	18	2R1	18	3R2	N/A	
96	22	1R	18	1R	20	2R1	18	2R1	18	2R2	18	3R2	N/A	
108	18	1R	18	2R1	18	2R1	18	2R2	18	2R2	18	3R2	N/A	
120	18	1R	18	2R1	18	2R2	18	2R2	18	2R2	18	3R2t	N/A	

The above table meets SMACNA 1995 duct construction standards for galvanized or stainless steel duct and fittings. The **TDC** (transverse duct connector by Lockformer) is an integral part of the duct or fitting and is roll formed on all sides of the end connections. **IR** is the intermediate reinforcement required. See Table 11 for a description of reinforcements and how they are applied. Both the major and the minor outer shell dimensions need to be checked for reinforcement requirements. Table 11 illustrates reinforcement when just the major outer shell dimension needs reinforced and when both the major and minor outer shell dimensions need reinforced. Fittings must be reinforced the same as duct. Determine the equivalent aluminum thickness requirements by multiplying the thickness in the above table by 1.44 and using the next heaviest available material. See Table 3 to determine the thickness by gauge and Table 1 to determine the gauge/thickness availability for various constructions. The minimum dimension of the major and the minor inner shell must be at least 6 inches.

Table 6 - Rectangular-k27 Heavy Gauge/Light Reinforcement for 5-Foot Joints Using External Angle Reinforcement

Maximum Outer Shell Major Axis (inches)	Pressure Classification (nominal 60-inch duct lengths)													
	±½ inch wg		±1 inch wg		±2 inch wg		±3 inch wg		±4 inch wg		±6 inch wg		±10 inch wg	
	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR
10	26		26		26		26		26		24		22	
12	26		26		26		26		26		24		22	
18	26		26		26		24		24		22		20	
24	26		26		26		24		22		22		18	
26	26		26		26		24		22		20		18	
28	26		26		24		22		22		18		20	1R
30	26		26		24		22		20		18		18	1R
36	26		24		22		20		18		20	1R	18	1R
42	26		24		20		18		20	1R	18	1R	20	2R1
48	24		22		18		20	1R	18	1R	22	2R1	18	2R1
54	24		22		18		20	1R	18	1R	20	2R1	18	2R1
60	24		20		20	1R	18	1R	22	2R1	20	2R1	18	2R2
72	22		18		18	1R	22	2R1	20	2R1	18	2R1	18	3R2
84	18		18	1R	22	2R1	20	2R1	18	2R1	18	3R2	N/A	
96	18		18	1R	20	2R1	18	2R1	18	2R2	18	3R2	N/A	
108	18	1R	18	2R1	18	2R1	18	2R2	18	2R2	18	3R2	N/A	
120	18	1R	18	2R1	18	2R2	18	2R2	18	2R2	18	3R2t	N/A	

The above table meets SMACNA 1995 duct construction standards for galvanized or stainless steel duct and fittings. The **TDC** (transverse duct connector by Lockformer) is an integral part of the duct or fitting and is roll formed on all sides of the end connections. **IR** is the intermediate reinforcement required. See Table 11 for a description of reinforcements and how they are applied. Both the major and the minor outer shell dimensions need to be checked for reinforcement requirements. Table 11 illustrates reinforcement when just the major outer shell dimension needs reinforced and when both the major and minor outer shell dimensions need reinforced. Fittings must be reinforced the same as duct. Determine the equivalent aluminum thickness requirements by multiplying the thickness in the above table by 1.44 and using the next heaviest available material. See Table 3 to determine the thickness by gauge and Table 1 to determine the gauge/thickness availability for various constructions. The minimum dimension of the major and the minor inner shell must be at least 6 inches.

Table 7 - Rectangular-k27 Light Gauge/Heavy Reinforcement for 6-Foot Joints Using External Angle Reinforcement

Maximum Outer Shell Major Axis (inches)	Pressure Classification (nominal 72-inch duct lengths)													
	±½ inch wg		±1 inch wg		±2 inch wg		±3 inch wg		±4 inch wg		±6 inch wg		±10 inch wg	
	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR
10	26		26		26		26		24		26	1R	26	1R
12	26		26		26		26	1R	24		26	1R	26	1R
18	26		26		24		26	1R	26	1R	26	1R	24	1R
24	26		26		26	1R	26	1R	26	2R	24	1R	22	2R
26	26		26		26	1R	26	1R	26	2R	24	2R	22	2R
28	26		26		26	1R	26	2R	26	2R	24	2R	22	2R
30	26		26		26	1R	26	2R	26	2R	24	2R	22	2R
36	26		26	1R	24	1R	24	2R	24	2R	22	2R	24	3R
42	26	1R	26	1R	24	1R	24	2R	22	2R	22	3R	22	3R1
48	26	1R	26	1R	24	2R	22	2R	20	2R	22	3R	22	3R1
54	26	2R	24	1R	22	2R	20	2R	24	3R1	22	3R1	20	3R1
60	26	2R	22	1R	22	2R	20	2R	24	3R1	22	3R1	20	3R1
72	24	2R	22	1R	22	2R	24	3R1	22	3R1	20	3R1	18	3R2
84	22	1R	20	2R	22	3R1	22	3R1	20	3R1	18	3R2	N/A	
96	22	2R	20	2R1	22	3R1	20	3R1	20	3R1	18	3R2	N/A	
108	18	1R	18	2R1	18	2R2	18	3R2	18	3R2	18	3R2	N/A	
120	18	2R	18	2R1	18	3R1	18	3R2	18	3R2	18	3R2t	N/A	

The above table meets SMACNA 1995 duct construction standards for galvanized or stainless steel duct and fittings. The **TDC** (transverse duct connector by Lockformer) is an integral part of the duct or fitting and is roll formed on all sides of the end connections. **IR** is the intermediate reinforcement required. See Table 12 for a description of reinforcements and how they are applied. Both the major and the minor outer shell dimensions need to be checked for reinforcement requirements. Table 12 illustrates reinforcement when just the major outer shell dimension needs reinforced and when both the major and minor outer shell dimensions need reinforced. Fittings must be reinforced the same as duct. Determine the equivalent aluminum thickness requirements by multiplying the thickness in the above table by 1.44 and using the next heaviest available material. See Table 3 to determine the thickness by gauge and Table 1 to determine the gauge/thickness availability for various constructions. The minimum dimension of the major and the minor inner shell must be at least 6 inches.

Table 8 - Rectangular-k27 Heavy Gauge/Light Reinforcement for 6-Foot Joints Using External Angle Reinforcement

Maximum Outer Shell Major Axis (inches)	Pressure Classification (nominal 72-inch duct lengths)													
	±½ inch wg		±1 inch wg		±2 inch wg		±3 inch wg		±4 inch wg		±6 inch wg		±10 inch wg	
	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR
10	26		26		26		26		24		22		20	
12	26		26		26		24		24		22		20	
18	26		26		24		24		22		20		18	
24	26		26		24		22		22		20		18	
26	26		26		24		22		22		18		20	1R
28	26		26		22		20		20		18		18	1R
30	26		26		22		20		18		18		18	1R
36	26		24		20		18		18		18	1R	20	2R
42	24		22		18		18		20	1R	18	1R	18	2R1
48	24		20		18		20	1R	18	1R	18	2R1	18	2R1
54	22		20		20	1R	18	1R	18	2R	18	2R1	20	3R1
60	22		20		20	1R	18	1R	20	2R	18	2R1	20	3R1
72	20		18		18	1R	20	2R1	18	2R	20	3R1	18	3R2
84	18		18	1R	20	2R1	18	2R1	20	3R1	18	3R2	N/A	
96	20	1R	20	1R	18	2R1	18	2R2	20	3R1	18	3R2	N/A	
108	18	1R	18	2R1	18	2R2	18	3R2	18	3R2	18	3R2	N/A	
120	18	2R	18	2R1	18	3R1	18	3R2	18	3R2	18	3R2t	N/A	

The above table meets SMACNA 1995 duct construction standards for galvanized or stainless steel duct and fittings. The **TDC** (transverse duct connector by Lockformer) is an integral part of the duct or fitting and is roll formed on all sides of the end connections. **IR** is the intermediate reinforcement required. See Table 12 for a description of reinforcements and how they are applied. Both the major and the minor outer shell dimensions need to be checked for reinforcement requirements. Table 12 illustrates reinforcement when just the major outer shell dimension needs reinforced and when both the major and minor outer shell dimensions need reinforced. Fittings must be reinforced the same as duct. Determine the equivalent aluminum thickness requirements by multiplying the thickness in the above table by 1.44 and using the next heaviest available material. See Table 3 to determine the thickness by gauge and Table 1 to determine the gauge/thickness availability for various constructions. The minimum dimension of the major and the minor inner shell must be at least 6 inches.

Table 9 - Rectangular-k27 Reinforcement for 5-Foot Joints Using Internal Tie Rod Reinforcement

Maximum Outer Shell Major Axis (inches)	Pressure Classification (nominal 60-inch duct lengths)											
	±½ inch wg		±1 inch wg		±2 inch wg		±3 inch wg		±4 inch wg		+6 inch wg	
	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR
10	26		26		26		26		26		24	
12	26		26		26		26		26		24	
18	26		26		26		24		24		22	
24	26		26		26		24		22		22	
26	26		26		26		24		22		20	
28	26		26		24		22		22		18	
30	26		26		24		22		20		18	
36	26		24		22		20		18		18	JTR
42	26		26	CTR	24	CTR	18		22	CTR/JTR	22	CTR/JTR
48	26	CTR	24	CTR	22	CTR	22	CTR/JTR	22	CTR/JTR	22	CTR/JTR
54	26	CTR	24	CTR	22	CTR	22	CTR/JTR	22	2CTR/JTR	20	CTR/JTR
60	24		24	CTR	22	CTR/JTR	22	2CTR/JTR	22	2CTR/JTR	18	CTR/JTR
72	24	CTR	22	CTR/JTR	22	CTR/JTR	22	2CTR/JTR	20	2CTR/JTR	18	CTR/JTR
84	22	CTR	22	2CTR/JTR	22	2CTR/JTR	20	2CTR/JTR	18	2CTR/JTR	N/A	
96	22	CTR	20	2CTR/JTR	20	2CTR/JTR	18	2CTR/JTR	18	2CTR/JTR	N/A	

The above table meets SMACNA 1995 duct construction standards for galvanized or stainless steel duct and fittings. When intermediate reinforcement is required, the Addendum No. 1, November, 1997, to HVAC Duct Construction Standards, Second Edition, 1995, is used for duct construction standards. For maximum major axis dimensions $\leq$ 36 inches, the gauges which do not require intermediate reinforcement are given. See Tables 5 and 6 for other options. The **TDC** (transverse duct connector by Lockformer) is an integral part of the duct or fitting and is roll formed on all sides of the end connections. **IR** is the intermediate reinforcement required. See Table 13 for a description of reinforcements and how they are applied. **CTR** means a center tie rod is used at midspan. **JTR** means a tie rod is used on each side of a joint. **2CTR/JTR** means two tie rods are used at midspan and one tie rod on each side of a joint. The **2CTR** tie rods are spaced at W/3. Both the major and the minor outer shell dimensions need to be checked for reinforcement requirements. Table 13 illustrates reinforcement when just the major outer shell dimension needs reinforced and when both the major and minor outer shell dimensions need reinforced. Fittings must be reinforced the same as duct. Determine the equivalent aluminum thickness requirements by multiplying the thickness in the above table by 1.44 and using the next heaviest available material. See Table 3 to determine the thickness by gauge and Table 1 to determine the gauge/thickness availability for various constructions. The minimum dimension of the major and the minor inner shell must be at least 6 inches.

Note: Internal tie rods at midspan are not allowed in the following applications:

- In ducts outside of buildings when the ducts do not have waterproof external insulation or waterproof and corrosion resistant duct wall penetrations.
- In ducts in which condensation or grease would collect except where no wall penetrations occur or the penetration is waterproof.
- In underground, in-slab or under-slab ducts.
- In fittings on non-parallel duct sides unless they do not penetrate the duct or they use load distributing means such as shims or wedges.
- When the air velocity exceeds 2500 fpm.
- Near centrifugal and axial flow fans where SYSTEM EFFECT FACTORS apply.

In these cases, use external reinforcement.

Table 10 - Rectangular-k27 Reinforcement for 6-Foot Joints Using Internal Tie Rod Reinforcement

Maximum Outer Shell Major Axis (inches)	Pressure Classification (nominal 72-inch duct lengths)											
	±½ inch wg		±1 inch wg		±2 inch wg		±3 inch wg		±4 inch wg		+6 inch wg	
	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR	GA	IR
10	26		26		26		26		24		22	
12	26		26		26		24		24		22	
18	26		26		24		24		22		20	
24	26		26		24		22		20		20	
26	26		26		24		22		20		20	
28	26		26		22		22		20		18	
30	26		26		22		20		18		18	
36	26		24		20		18		18		20	CTR/JTR
42	26	CTR	26	CTR	24	CTR	22	CTR/JTR	22	CTR/JTR	20	CTR/JTR
48	26	CTR	24	CTR	22	CTR	22	CTR/JTR	22	CTR/JTR	18	CTR/JTR
54	24	CTR	24	CTR	22	CTR/JTR	22	2CTR/JTR	20	2CTR/JTR	18	CTR/JTR
60	24	CTR	22	CTR	22	CTR/JTR	20	2CTR/JTR	20	2CTR/JTR	18	2CTR/JTR
72	24	CTR	22	CTR/JTR	22	2CTR/JTR	20	2CTR/JTR	18	2CTR/JTR	N/A	
84	22	CTR	22	2CTR/JTR	20	2CTR/JTR	18	2CTR/JTR	18	2CTR/JTR	N/A	
96	22	CTR	20	2CTR/JTR	18	2CTR/JTR	N/A		N/A		N/A	

The above table meets SMACNA 1995 duct construction standards for galvanized or stainless steel duct and fittings. When intermediate reinforcement is required, the Addendum No. 1, November, 1997, to HVAC Duct Construction Standards, Second Edition, 1995, is used for duct construction standards.For maximum major axis dimensions $\leq$ 36 inches, the gauges which do not require intermediate reinforcement are given. See Tables 7 and 8 for other options. The **TDC** (transverse duct connector by Lockformer) is an integral part of the duct or fitting and is roll formed on all sides of the end connections. **IR** is the intermediate reinforcement required. See Table 14 for a description of reinforcements and how they are applied. **CTR** means a center tie rod is used at midspan. **JTR** means a tie rod is used on each side of a joint. **2CTR/JTR** means two tie rods are used at midspan and one tie rod on each side of a joint. The **2CTR** tie rods are spaced at W/3. Both the major and the minor outer shell dimensions need to be checked for reinforcement requirements. Table 14 illustrates reinforcement when just the major outer shell dimension needs reinforced and when both the major and minor outer shell dimensions need reinforced. Fittings must be reinforced the same as duct. Determine the equivalent aluminum thickness requirements by multiplying the thickness in the above table by 1.44 and using the next heaviest available material. See Table 3 to determine the thickness by gauge and Table 1 to determine the gauge/thickness availability for various constructions. The minimum dimension of the major and the minor inner shell must be at least 6 inches.

Note: Internal tie rods at midspan are not allowed in the following applications:

- In ducts outside of buildings when the ducts do not have waterproof external insulation or waterproof and corrosion resistant duct wall penetrations.
- In ducts in which condensation or grease would collect except where no wall penetrations occur or the penetration is waterproof.
- In underground, in-slab or under-slab ducts.
- In fittings on non-parallel duct sides unless they do not penetrate the duct or they use load distributing means such as shims or wedges.
- When the air velocity exceeds 2500 fpm.
- Near centrifugal and axial flow fans where SYSTEM EFFECT FACTORS apply.

In these cases, use external reinforcement.

Table 11 - Reinforcement Diagrams for 5-Foot Joints Using External Angle

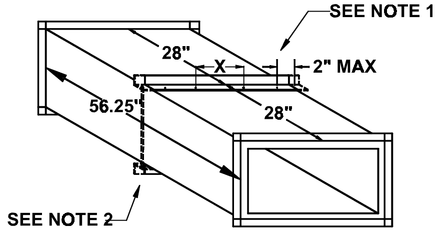
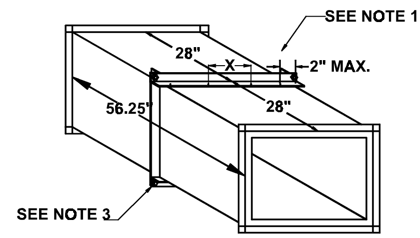
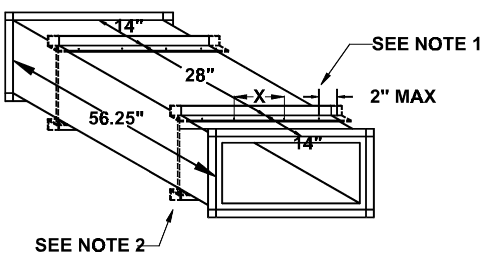
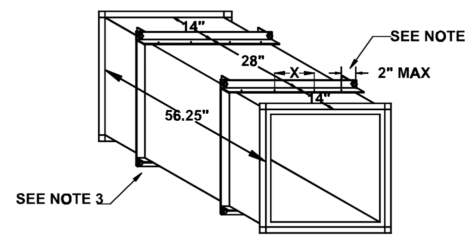
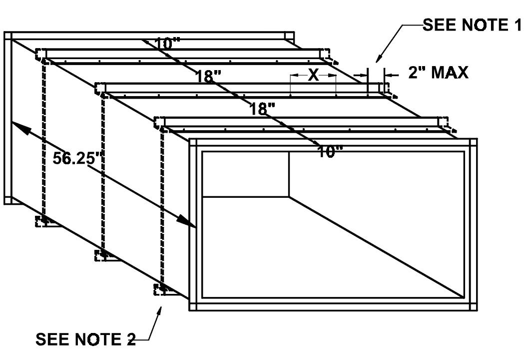
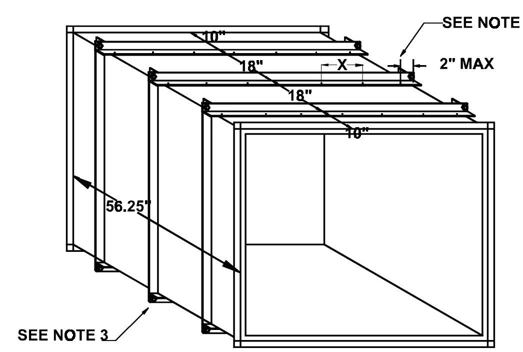
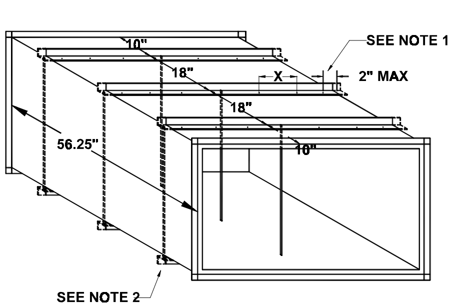
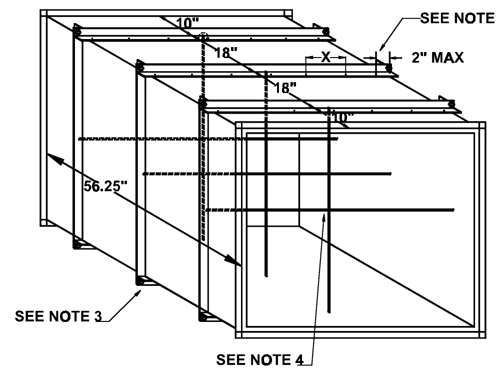
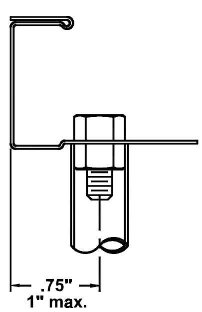
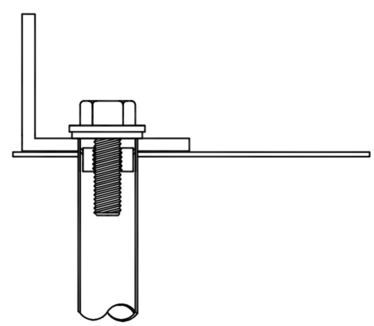
2 Sides Reinforced	4 Sides Reinforced
	
1R = ONE 2" X 10 GAUGE ANGLE LOCATED AT MIDSPAN	
	
2R = TWO 2" X 10 GAUGE ANGLES LOCATED AS SHOWN **2R1 = TWO 2" X 1/4" ANGLES LOCATED AS SHOWN** **2R2 = TWO 2.5" X 1/4" ANGLES LOCATED AS SHOWN**	
	
3R1 = THREE 2" X 1/4" ANGLES LOCATED AS SHOWN **3R2 = THREE 2.5" X 1/4" ANGLES LOCATED AS SHOWN**	

Table 11 - Reinforcement for 5-Foot Joints Using External Angle (continued)

2 Sides Reinforced	4 Sides Reinforced
	
3R2t = THREE 2.5" X 1/4" ANGLES WITH ½" EMT CONDUIT AT EACH REINFORCEMENT LOCATION AS SHOWN	
 **DETAIL OF CONDUIT TIE ROD**	 **DETAIL OF TIE ROD THROUGH REINFORCEMENT**

NOTES:

1. X = tack weld spacing at 12" maximum starting at a maximum of 2" from the edge. When end ties are used the 2" maximum interval may be omitted.
2. Outside tie rods are required when the pressure classification is at 4" wg or more with two sides reinforced.
3. Tie ends with 5/16" bolts or adequate welds when duct is at 4" wg or more with four sides reinforced. When welding use two parallel welds.
4. When tie rods are required in both directions, space apart ½" to 1" maximum to avoid contact.

Table 12 - Reinforcement for 6-Foot Joints Using External Angle

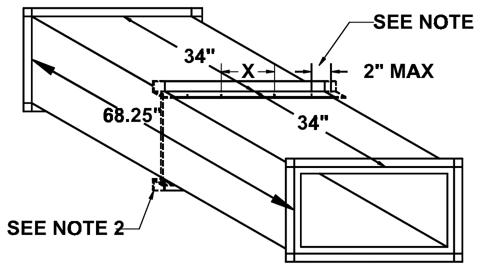
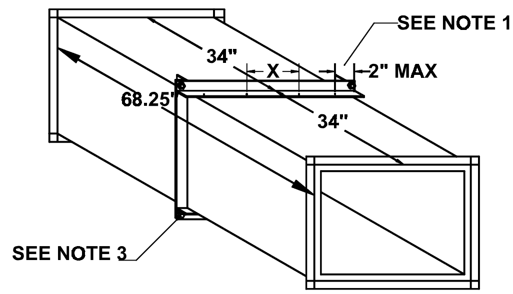
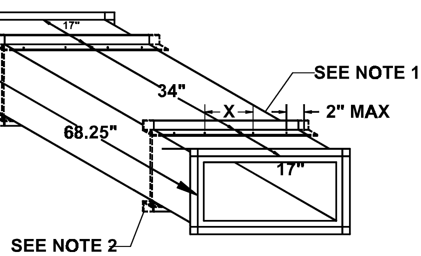
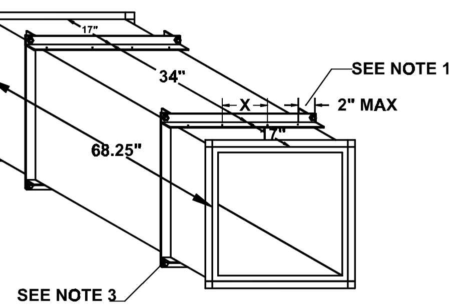
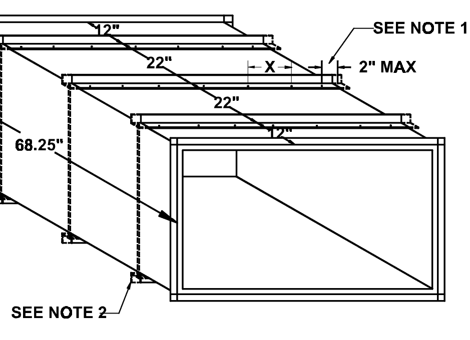
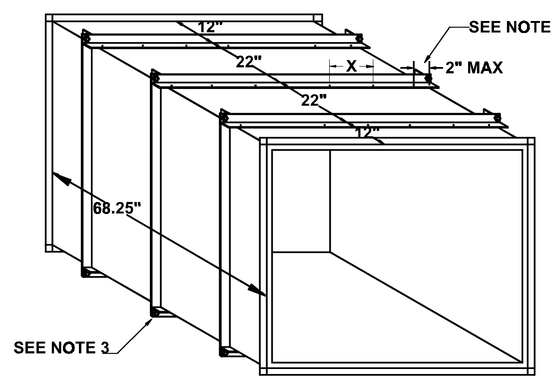
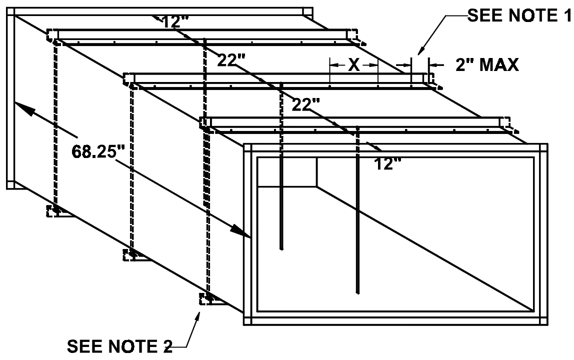
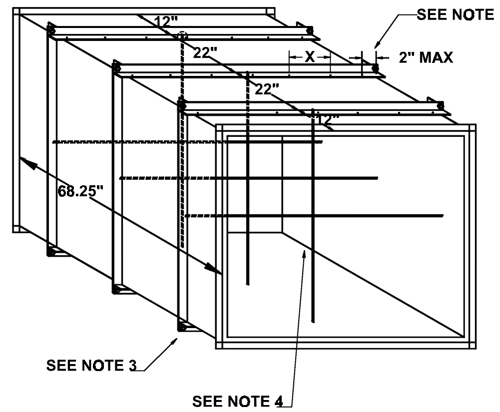
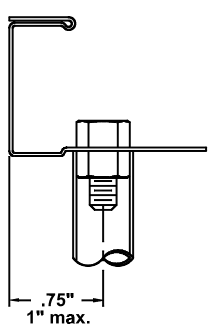
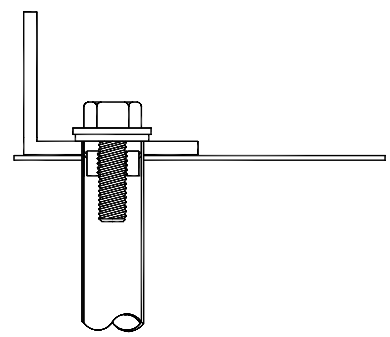
<table>
<tr><th>2 Sides Reinforced</th><th>4 Sides Reinforced</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">1R = ONE 2" X 10 GAUGE ANGLE LOCATED AT MIDSPAN</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">2R = TWO 2" X 10 GAUGE ANGLES LOCATED AS SHOWN
2R1 = TWO 2" X 1/4" ANGLES LOCATED AS SHOWN
2R2 = TWO 2.5" X 1/4" ANGLES LOCATED AS SHOWN</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">3R1 = THREE 2" X 1/4" ANGLES LOCATED AS SHOWN
3R2 = THREE 2.5" X 1/4" ANGLES LOCATED AS SHOWN</td></tr>
</table>

Table 12 - Reinforcement for 6-Foot Joints Using External Angle (continued)

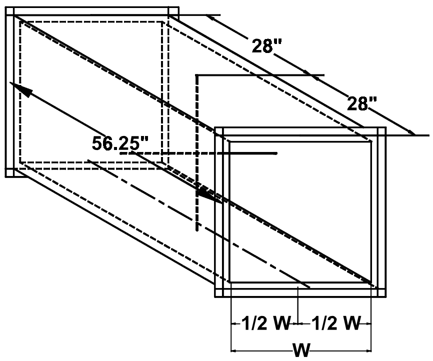
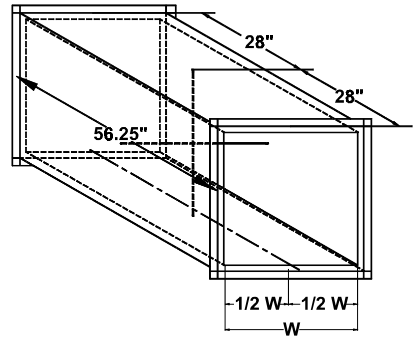
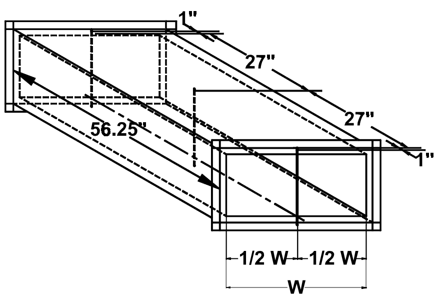
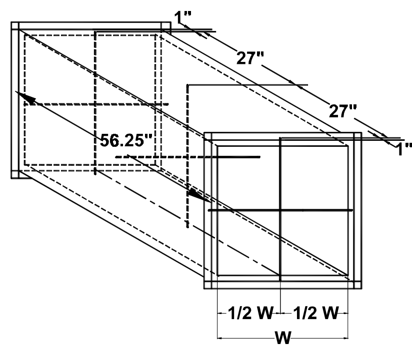
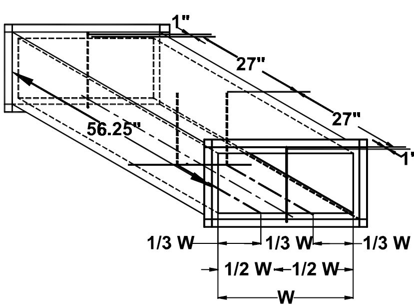
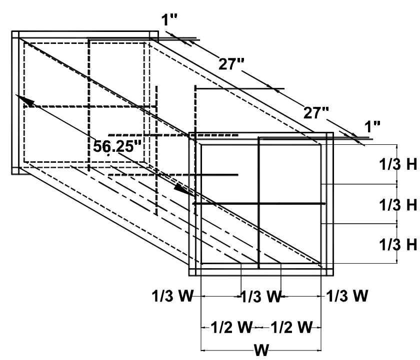
<table>
<tr><th>2 Sides Reinforced</th><th>4 Sides Reinforced</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">3R2t = THREE 2.5" X 1/4" ANGLES WITH ½" EMT CONDUIT AT EACH REINFORCEMENT LOCATION AS SHOWN</td></tr>
<tr><td>

DETAIL OF CONDUIT TIE ROD</td><td>
DETAIL OF TIE ROD THROUGH REINFORCEMENT</td></tr>
</table>

NOTES:

1. X = tack weld spacing at 12" maximum starting at a maximum of 2" from the edge. When end ties are used the 2" maximum interval may be omitted.
2. Outside tie rods are required when the pressure classification is at 4" wg or more with two sides reinforced.
3. Tie ends with 5/16" bolts or adequate welds when duct is at 4" wg or more with four sides reinforced. When welding use two parallel welds.
4. When tie rods are required in both directions, space apart ½" to 1" maximum to avoid contact.

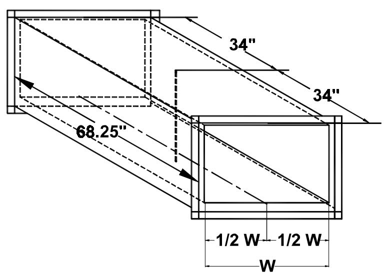
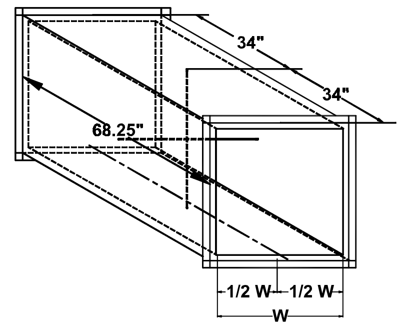
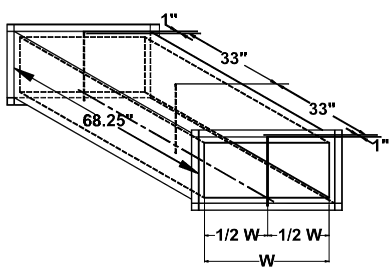
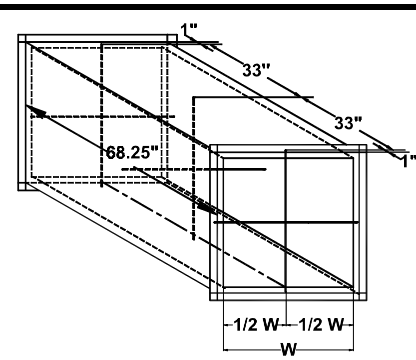
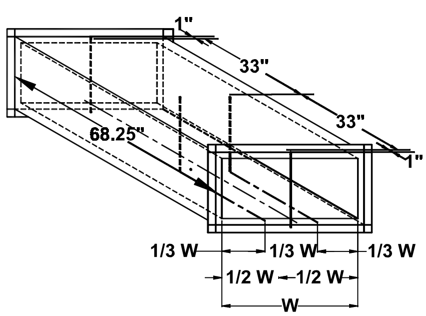
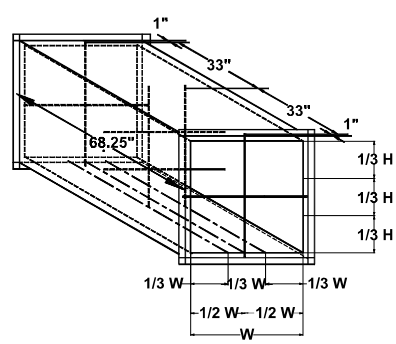
Table 13 - Reinforcement for 5-Foot Joints Using Internal Tie Rods

<table>
<tr><th>2 Sides Reinforced</th><th>4 Sides Reinforced</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">CTR = ONE TIE ROD CENTERED ON 5' DUCT SECTION</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">CTR/JTR = TIE ROD AT EACH JOINT AND CENTERED ON 5' SECTION</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">2CTR/JTR = ONE TIE ROD AT EACH JOINT AND TWO TIE RODS AT MIDSPAN, SPACED AT 1/3W AND 1/3H</td></tr>
</table>

NOTES:

1. Tie rods should be spaced no more than 48" apart in a cross section. Use one tie rod, in each direction required, for duct 96" wide or less.
2. When tie rods are required in both directions, space apart ½" to 1" maximum to avoid contact.
3. Tie rods are 1/2" EMT conduit. See Table 10 or 11 for detail of conduit tie rod.

Table 14 - Reinforcement for 6-Foot Joints Using Internal Tie Rods

2 Sides Reinforced	4 Sides Reinforced
	
CTR = ONE TIE ROD CENTERED ON 6' DUCT SECTION	
	
CTR/JTR = TIE ROD AT EACH JOINT AND CENTERED ON 6' SECTION	
	
2CTR/JTR = ONE TIE ROD AT EACH JOINT AND TWO TIE RODS AT MIDSPAN, SPACED AT 1/3W AND 1/3H	

NOTES:

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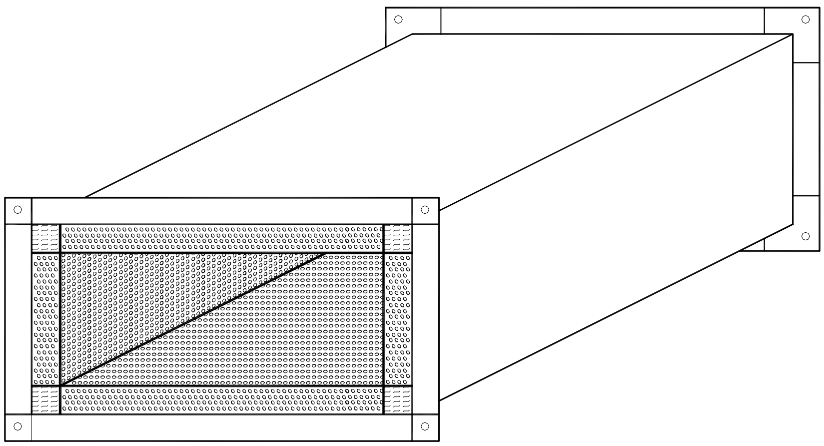
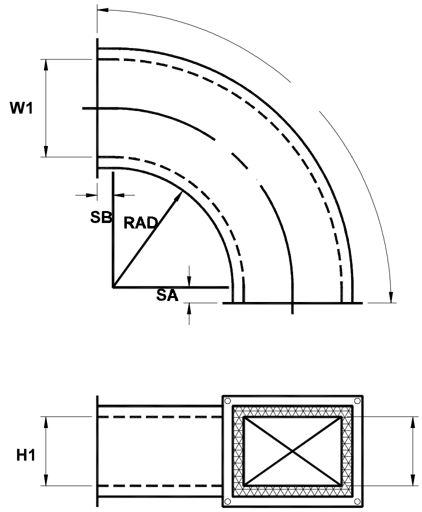
2. When tie rods are required in both directions, space apart ½" to 1" maximum to avoid contact.
3. Tie rods are 1/2" EMT conduit. See Table 10 or 11 for detail of conduit tie rod.

RECTANGULAR k-27 DUCT
(Assembled)

DESIGNATION:
AD



RADIUS ELBOW



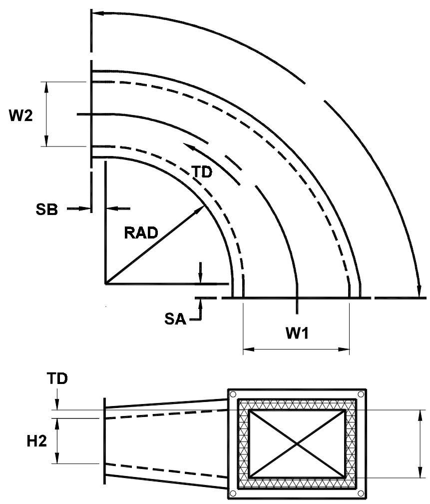
DESIGNATION:
KAT(*)E-θ

DIMENSIONS:
User Specified
W1, H1, RAD, SA, SB, t,
θ = 1° to 90°

Defaults
SA, SB = 0
RAD = W1
t = 1 inch

REDUCING RADIUS ELBOW

(Left Turning)



DESIGNATION:
KAT(*)ELR-θ

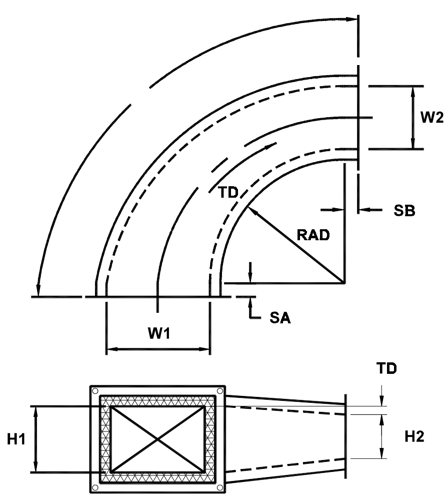
DIMENSIONS:
User Specified
W1, H1, W2, H2, t,
RAD, TD, SA, SB,
θ = 1° to 90°

Defaults
SA, SB = 0
RAD = W1
TD = 0
t = 1 inch

Note: When TD = 0, then fitting will be FOT.

REDUCING RADIUS ELBOW

(Right Turning)



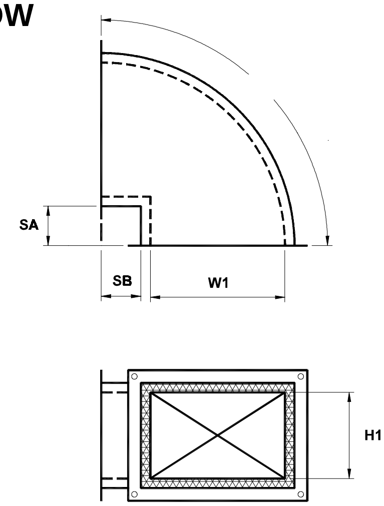
DESIGNATION:
KAT(*)ER-θ

DIMENSIONS:
User Specified
W1, H1, W2, H2, t,
RAD, TD, SA, SB,
θ = 1° to 90°

Defaults
SA, SB = 0
RAD = W1
TD = 0
t = 1 inch

Note: When TD = 0, then fitting will be FOT.

RADIUS ELBOW
(With square throat)

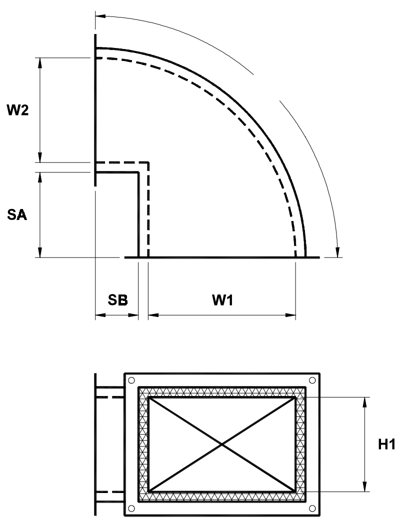


DESIGNATION:
KAT(*)ES-θ

DIMENSIONS:
User Specified
W1, H1, SA, SB,
θ = 1° to 90°

Defaults
SA, SB = 4"

REDUCING RADIUS ELBOW
(With square throat)

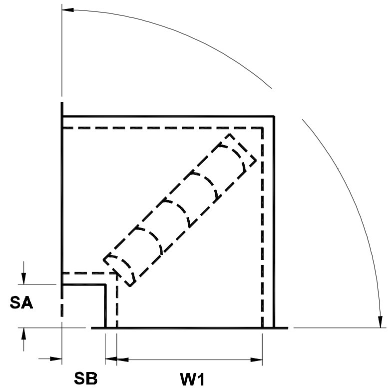


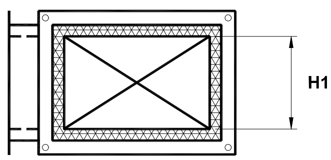
DESIGNATION:
KAT(*)ESR-θ

DIMENSIONS:
User Specified
W1, H1, W2, SA, SB,
θ = 1° to 90°

Defaults
SA, SB = 4"

MITERED ELBOW





DESIGNATION:
KAT(*)EMV-90
with turning vanes
(shown)

KAT(*)EM-θ
without turning vanes
(not shown)

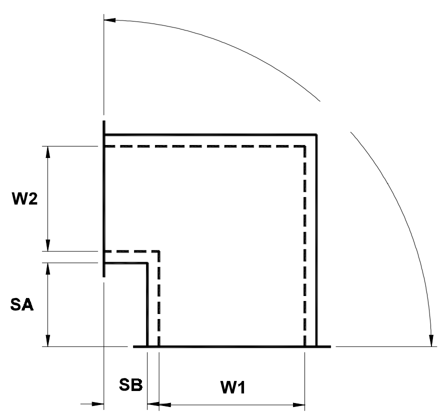
DIMENSIONS:
User Specified
W1, H1, SA, SB,
Type of Vane(see table below),
θ = 1° to 90°(only for elbows without turning vanes)

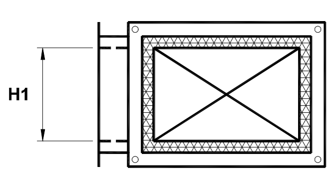
Defaults
SA, SB = 4"

Types of Vanes (Must be specified)

Type	Radius (inches)	Approximate spacing (inches)	Gauge
Single Thickness	2	1 1/2	24
Single Thickness	4 1/2	3 1/4	22
Double Thickness (default)	2	2 1/8-2 1/2	26
Double Thickness	4 1/2	3 1/4-3 1/2	24

REDUCING MITERED ELBOW





DESIGNATION:
KAT(*)EMR2-θ

DIMENSIONS:
User Specified
W1, W2, H1, SA, SB,
θ = 1° to 90°

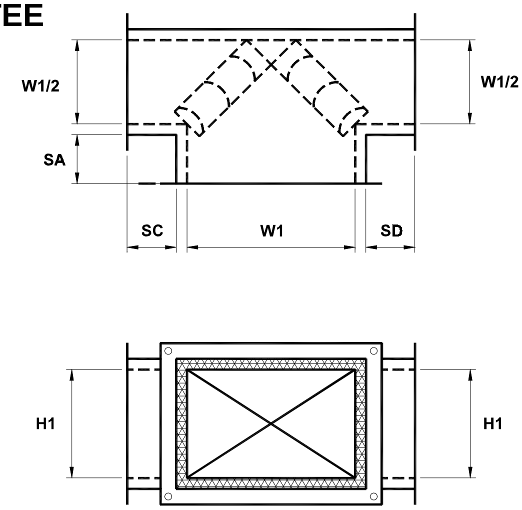
Defaults
SA, SB = 4"

Note: For a reducing mitered elbow with turning vanes (W2 < W1), use a standard mitered elbow with turning vanes and a reducing transition.

BULLHEAD TEES and Y-BRANCHES

McGill AirFlow Corporation

BULLHEAD TEE



DESIGNATION:

KAT(*)TBV
with turning vanes
(shown)

KAT(*)TB
without turning vanes
(not shown)

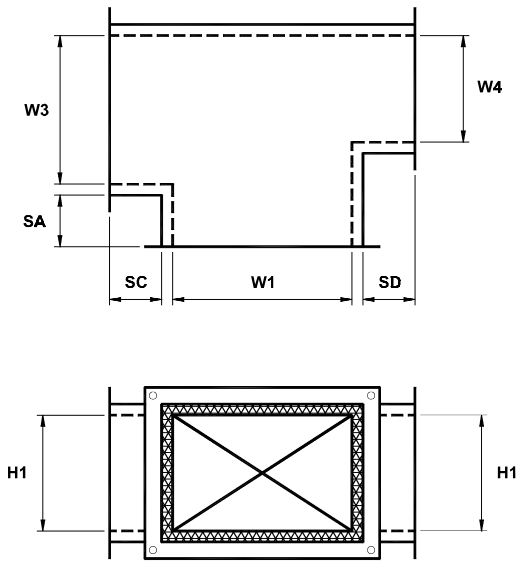
DIMENSIONS:

<u>User Specified</u>
W1, H1, SA, SC, SD,
Type of vane

<u>Defauts</u>
SA, SC, SD = 4"

See page 21 for Type of Vane table.

REDUCING BULLHEAD TEE



DESIGNATION:
KAT(*)TBR

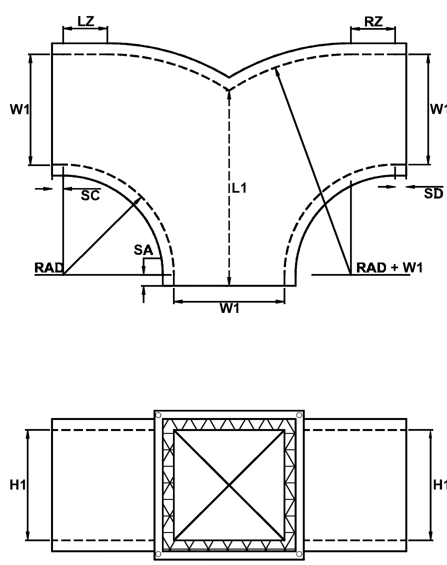
DIMENSIONS:

<u>User Specified</u>
W1, H1, W3, W4,
SA, SC, SD

<u>Defaults</u>
SA, SC, SD = 4"

Note: For a reducing bullhead tee with turning vanes (W3 or W4 ≠ W1/2), use a standard bullhead tee with turning vanes and reducing transitions.

Y-BRANCH



DESIGNATION:
KAT(*)YC

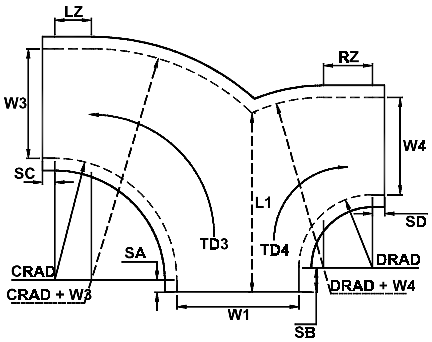
DIMENSIONS:

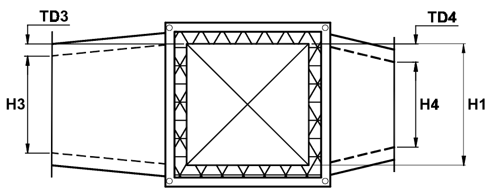
<u>User Specified</u>
W1, H1, RAD,
SA, SC, SD

<u>Defaults</u>
SA, SC, SD, LZ, RZ = 0
RAD = W1

Notes: L1 is the crotch height. If it is too low, RZ and LZ will be adjusted to raise it. This will not affect the overall dimensions of the fitting.

REDUCING Y-BRANCH





DESIGNATION:
KAT(*)YCR

DIMENSIONS:

User Specified
W1, H1, W3, H3, W4,H4, CRAD, DRAD, SA, SB, SC, SD, LZ, RZ

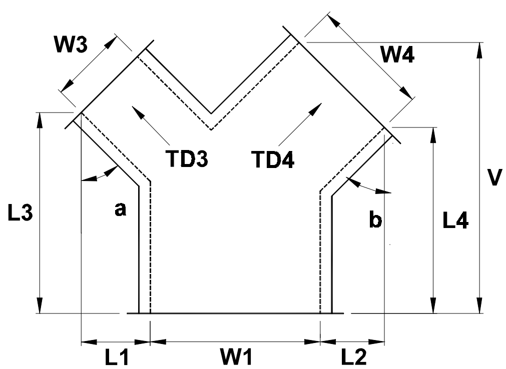
Defaults
SA, SB, SC, SD, LZ, RZ, TD3, TD4 = 0
CRAD, DRAD = W1

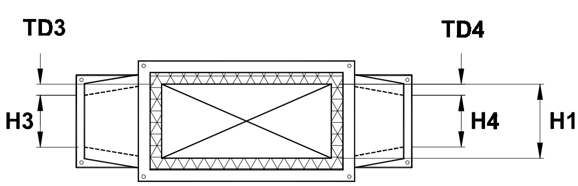
Notes:

1. When TD3 = 0, W3 is FOT.
   When TD4 = 0, W4 is FOT.

2. L1 is the crotch height. If it is too low, RZ and/or LZ will be adjusted to raise it. This will not affect the overall dimensions of the fitting.

REDUCING YV





DESIGNATION:
KAT(*)YV

DIMENSIONS:

User Specified
W1, H1, W3, H3, W4, H4, θ_a, θ_b, L1, L2, L3, L4, V

Defaults

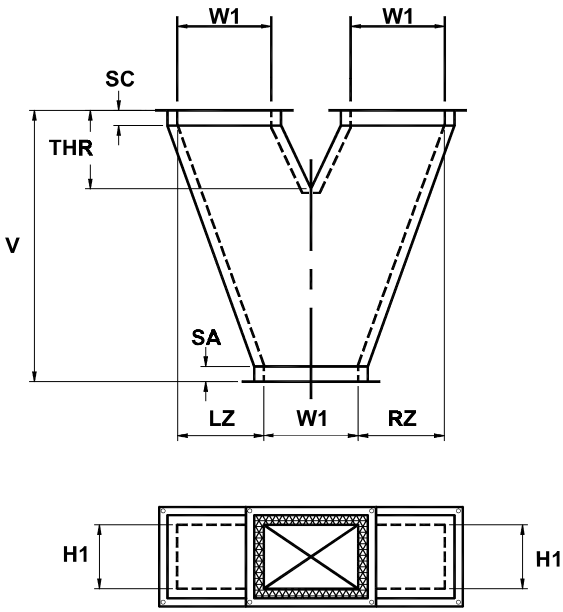
$$TD3 = \frac{(H1 - H3)}{2}$$

$$TD4 = \frac{(H1 - H4)}{2}$$

θ_a, θ_b = 45°

Note: L3 > L1, L4 > L2
When TD3, TD4 = 0 then fitting will be FOT.

PANTS



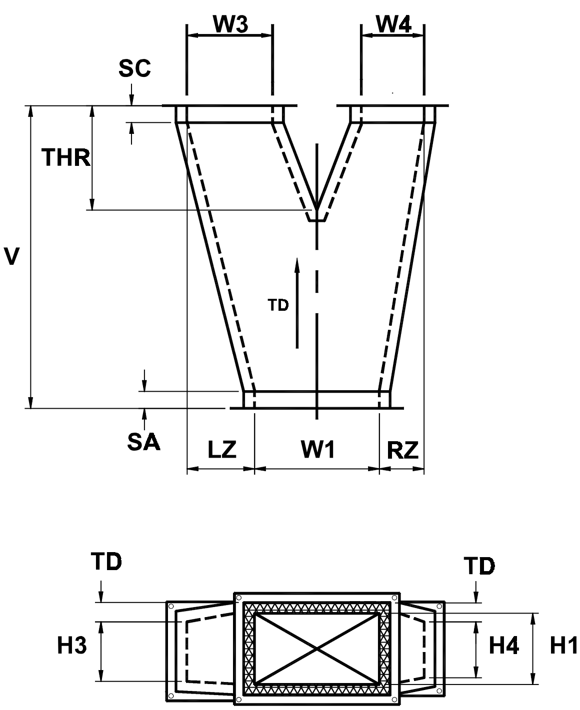
DESIGNATION:
KAT(*)YS

DIMENSIONS:

User Specified
W1, H1, THR, LZ, RZ,
V, SA, SC, SD

Defaults
SA, SC, SD = 0
V = 2W1

REDUCING PANTS



DESIGNATION:
KAT(*)YSR

DIMENSIONS:

User Specified
W1, H1, W3, H3, W4,
THR, LZ, RZ, SA, SC,
SD, TD, V

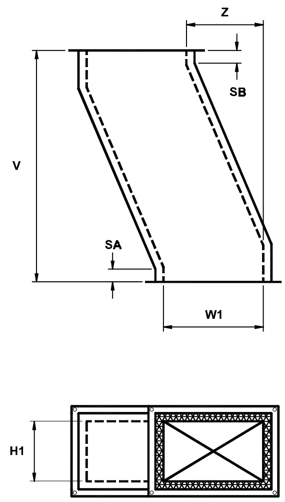
Defaults
SA, SC, SD, TD = 0
V = 2W1

Note: When TD = 0, then fitting will be FOT.

OFFSETS

McGill AirFlow Corporation

OFFSET



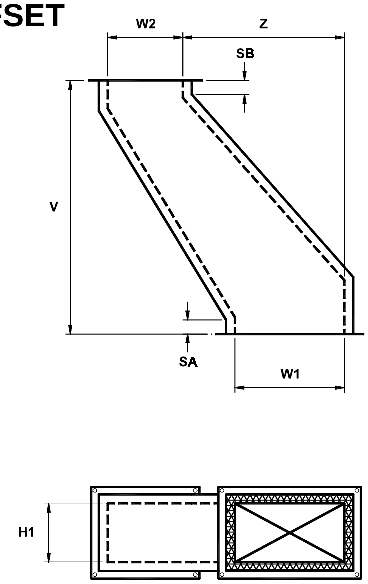
DESIGNATION:
KAT(*)Z

DIMENSIONS:
User Specified
W1, H1, Z, SA, SB, V

Defaults
SA, SB = 0
V = 2W1

Note: Z should not exceed .75 W1 or θ > 60°. If larger, use fabricated elbows and a straight length of duct.

REDUCING OFFSET



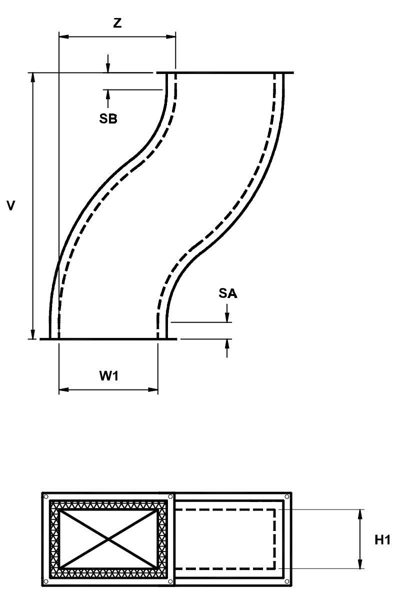
DESIGNATION:
KAT(*)ZR

DIMENSIONS:
User Specified
W1, H1, W2, Z,
SA, SB,V

Defaults
SA, SB = 0
V = 2W1

Note: Z should not exceed .75 W1 or θ > 60°. If larger, use fabricated elbows and a straight length of duct.

RADIUS OFFSET



DESIGNATION:
KAT(*)ZC

DIMENSIONS:
User Specified
W1, H1, Z, SA, SB, V

Defaults
SA, SB = 0
V = 2W1

Note: Z should not exceed .75 W1 or θ > 60°. If larger, use fabricated elbows and a straight length of duct.

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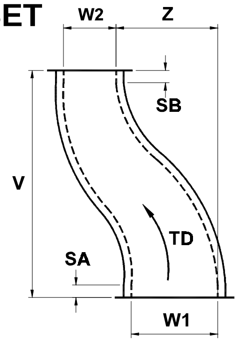
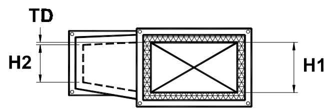
REDUCING RADIUS OFFSET
(Left turning)





DESIGNATION:
KAT(*)ZCLR

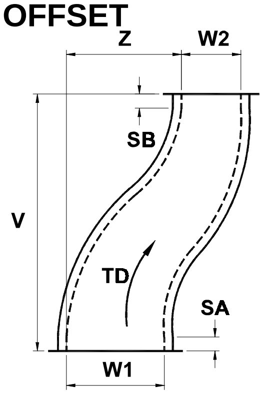
DIMENSIONS:
User Specified
W1, H1, W2, H2, Z,
SA, SB, V, TD

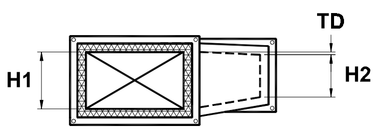
Defaults
SA, SB = 0
V = 2W1
TD = 0

Note: Z should not exceed .75 W1 or $\theta > 60°$. If larger, use fabricated elbows and a straight length of duct.

Note: When TD = 0, then fitting will be FOT.

REDUCING RADIUS OFFSET
(Right turning)





DESIGNATION:
KAT(*)ZCR

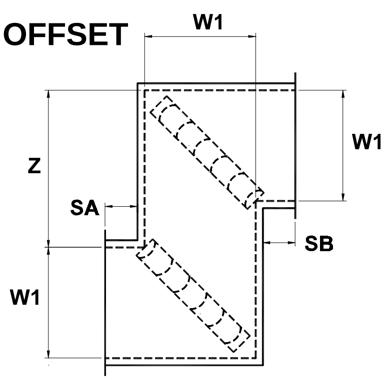
DIMENSIONS:
User Specified
W1, H1, W2, H2, Z,
SA, SB, V, TD

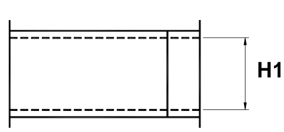
Defaults
SA, SB = 0
V = 2W1
TD = 0

Note: Z should not exceed .75 W1 or $\theta > 60°$. If larger, use fabricated elbows and a straight length of duct.

Note: When TD = 0, then fitting will be FOT.

MITERED ELBOW OFFSET





DESIGNATION:
KAT(*)ZEV
with turning vanes
(shown)
KAT(*)ZE
without turning vanes
(not shown)

DIMENSIONS:
User Specified
W1, H1, Z, SA, SB,
Type of vanes

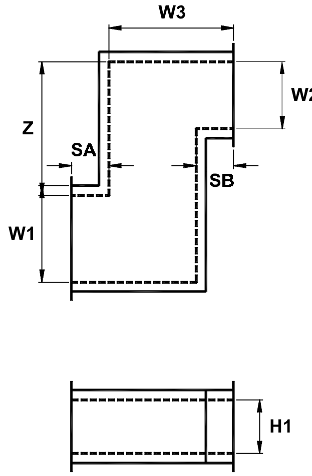
Defaults
SA, SB = 4"

See page 21 for Type of Vane table.

OFFSETS AND TRANSITIONS

McGill AirFlow Corporation

REDUCING MITERED ELBOW OFFSET



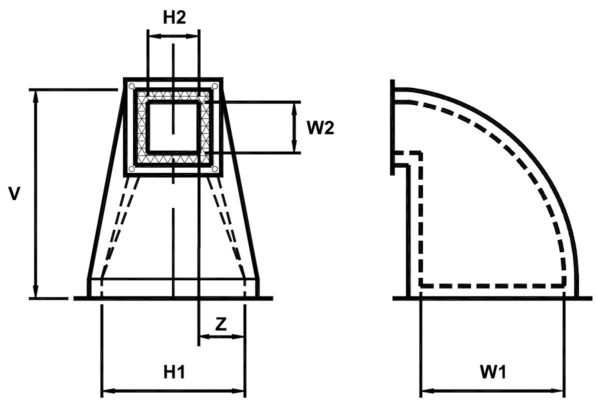
DESIGNATION:
KAT(*)ZER

DIMENSIONS:
User Specified
W1, H1, W2, W3, Z, SA, SB

Defaults
SA, SB = 4"

Note: For a reducing mitered elbow offset with turning vanes (W2 < W1), use a standard mitered elbow offset with turning vanes and reducing transitions.

PARKER

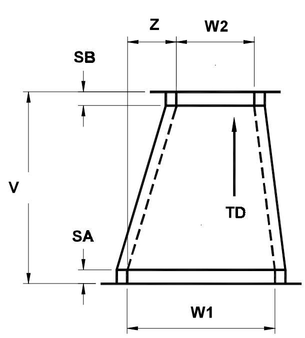


DESIGNATION:
KAT(*)K

DIMENSIONS:
User Specified
W1, H1, W2, H2, V, Z

Defaults
$Z = \frac{H1 - H2}{2}$

GENERAL TRANSITION

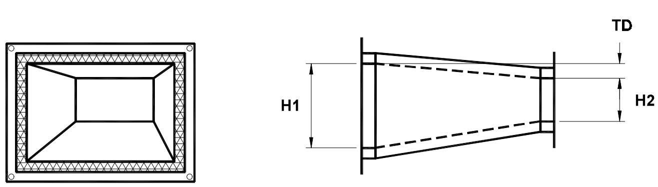


DESIGNATION:
KAT(*)R-20

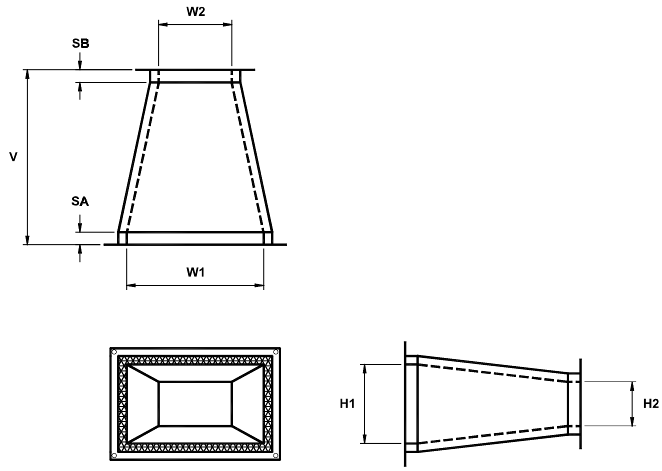
DIMENSIONS:
User Specified
W1, H1, W2, H2, V, Z, TD

Defaults
SA, SB = 0

Note: When TD = 0, then fitting will be FOT.



CONCENTRIC TRANSITION



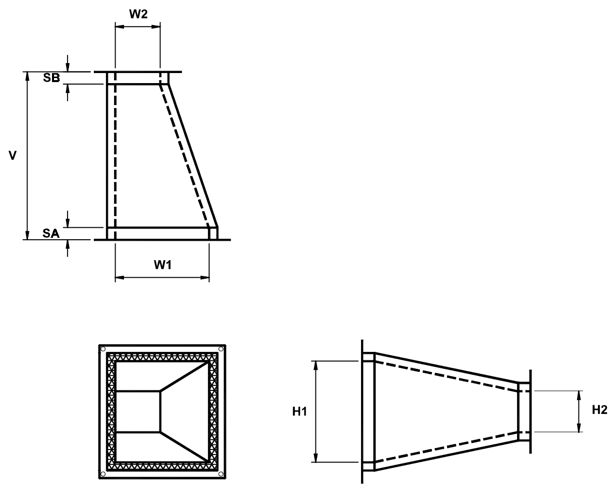
DESIGNATION:
KAT(*)R-30

DIMENSIONS:
User Specified
W1, H1, W2, H2, V

Defaults
SA, SB = 0

ECCENTRIC TRANSITION

(Left side flat and elevation concentric)



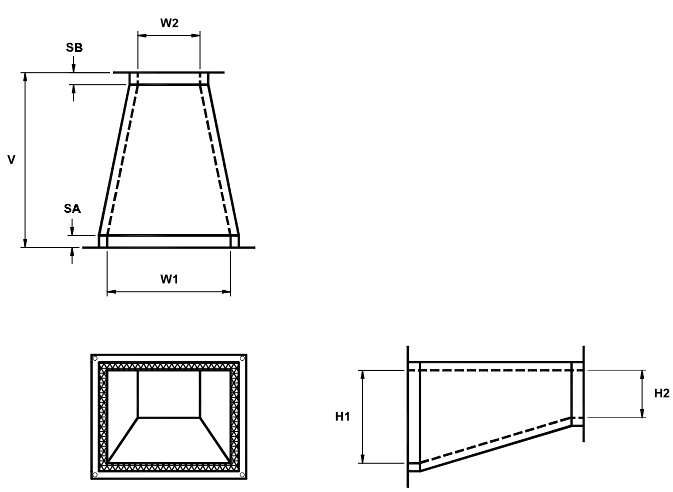
DESIGNATION:
KAT(*)R-31

DIMENSIONS:
User Specified
W1, H1, W2, H2, V

Defaults
SA, SB = 0

ECCENTRIC TRANSITION

(Top flat and concentric plan)



DESIGNATION:
KAT(*)R-32

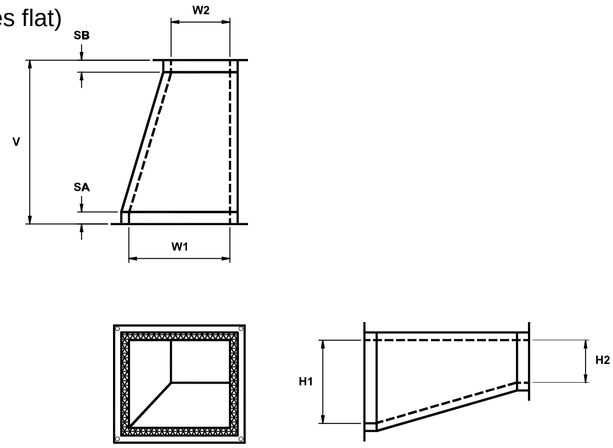
DIMENSIONS:
User Specified
W1, H1, W2, H2, V

Defaults
SA, SB = 0

TRANSITIONS AND END CAP

ECCENTRIC TRANSITION

(Top and right sides flat)



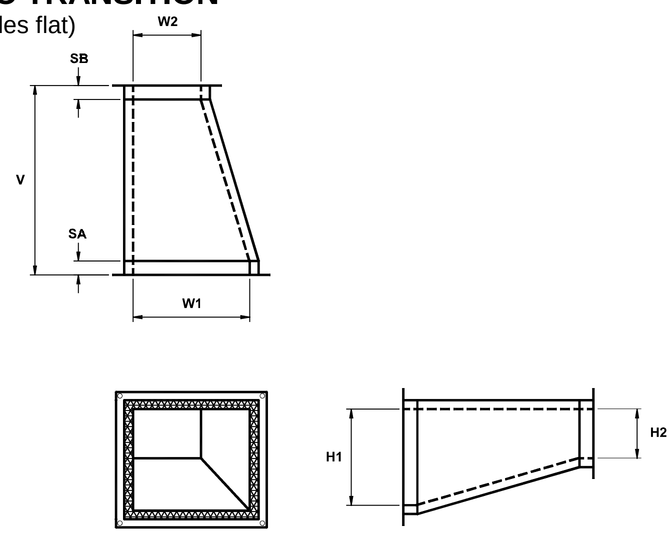
DESIGNATION:
KAT(*)R-331

DIMENSIONS:
User Specified
W1, H1, W2, H2, V

Defaults
SA, SB = 0

ECCENTRIC TRANSITION

(Top and left sides flat)

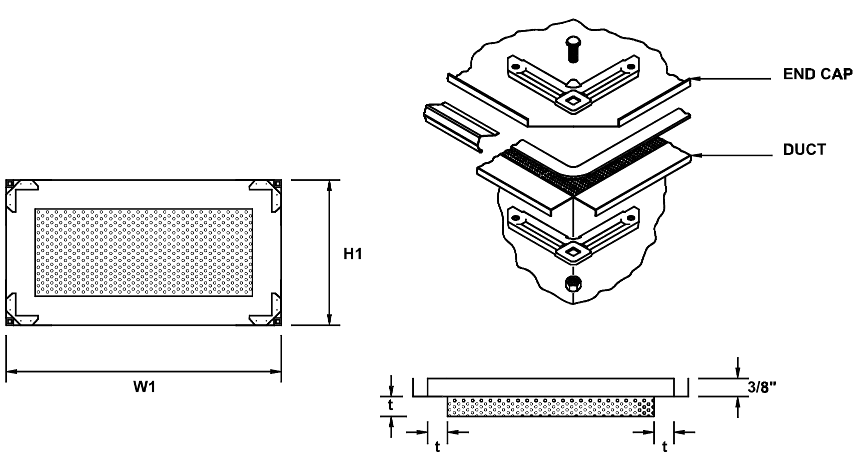


DESIGNATION:
KAT(*)R-332

DIMENSIONS:
User Specified
W1, H1, W2, H2, V

Defaults
SA, SB = 0

END CAP



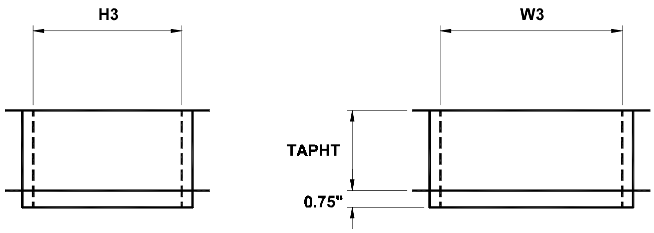
DESIGNATION:
KAT(*)EC

DIMENSIONS:
User Specified
W1, H1, t

TAPS

McGill AirFlow Corporation

90° TAP

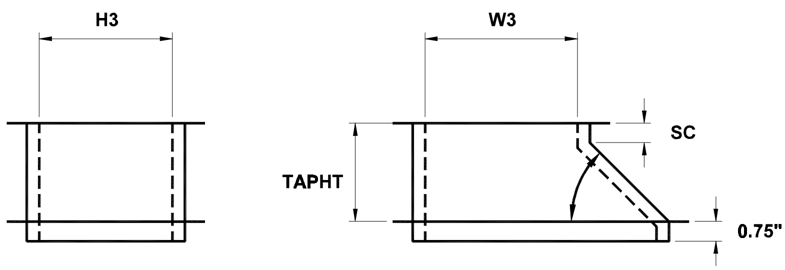


DESIGNATION:
KAT(*)PT

DIMENSIONS:
<u>User Specified</u>
W3, H3, TAPHT

<u>Default</u>
TAPHT = 3 inches

LOLOSS TAP



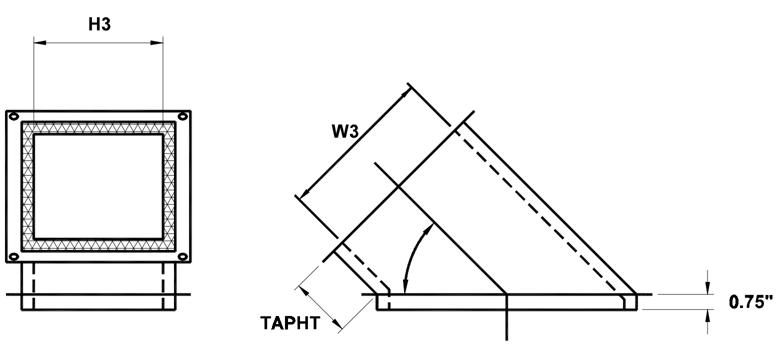
DESIGNATION:
KAT(*)PTL
KAT(*)PTL-θ
(if θ ≠ 45°)

DIMENSIONS:
<u>User Specified</u>
W3, H3, TAPHT,
θ = 1° to 90° if θ ≠ 45°

<u>Defaults</u>
SC = 0
TAPHT = 6 inches
θ = 45°

Note: Use SC to extend the tap height rather than connecting to short pieces of ductwork.

ANGLED TAP



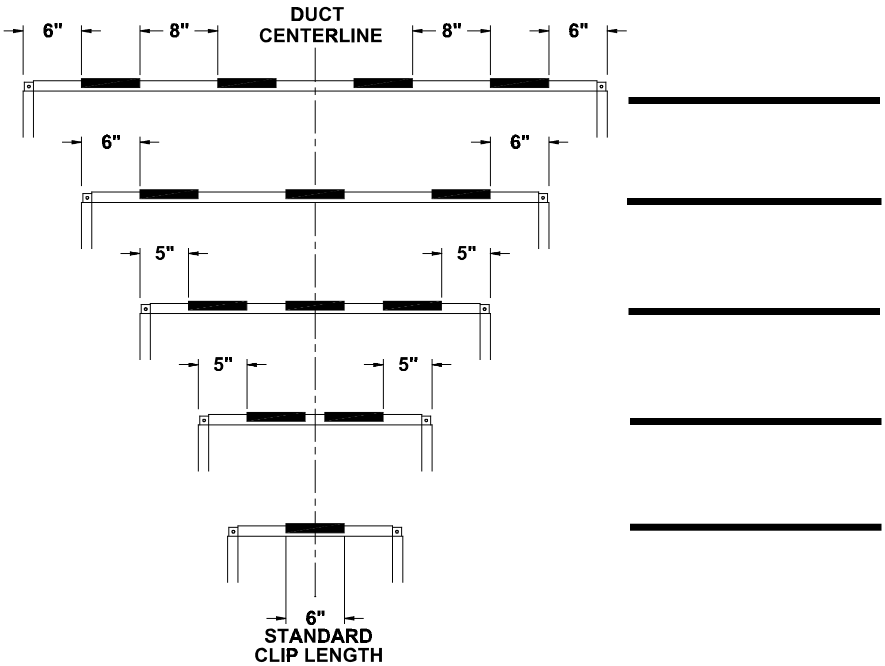
DESIGNATION:
KAT(*)PL
KAT(*)PL-θ
(if θ ≠ 45°)

DIMENSIONS:
<u>User Specified</u>
W3, H3, TAPHT,
θ = 1° to 90° if θ ≠ 45°

<u>Default</u>
TAPHT = 3 inches
θ = 45°

DUCT CLIPS

DUCT CLIP REQUIREMENTS



60" width, 4 clips required

48" width, 3 clips required

36" width, 3 clips required

24" width, 2 clips required

18" width, 1 clips required

McGill AirFlow LLC

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Web site: mcgillairflow.com