



**TABLE 1-1
PRESSURE CLASSIFICATION
FOR DUCTWORK**

STATIC PRESSURE CLASS (INCHES (Pa) W.G.)	+1/2"	-1/2"	+1"	-1"	+2"	-2"	+3"	-3"	+4"	-4"	+6"	-6"	+10"	-10"
Rectangular Style	A	A	STD	STD	STV	A	A	A	A	A	A	A	A	A
Round Style					STV	STD			A	A			A	A
Flat Oval Style			STD		STV		A		A		A			
Flexible Style	A	A	STD	STD	STV		A		A		A		A	

NOTES FOR TABLE 1-1:

1. "STD" denotes standard (nonvariable volume) air duct construction requirements (regardless of actual velocity level) for compliance with this document for all cases in which the designer does not designate the pressure classification for the duct system independent of fan static rating. "STV" denotes the standard construction classification for variable volume ducts for compliance with this document when the designer does not designate a class for this application.
See S1.4 on Page 1-8.
2. "A" denotes other pressure classes for which construction or installation details are given in this document and are AVAILABLE for designation in contract documents prepared by designers.
3. *See Section S1.9 for sealing requirements related to duct pressure class.*
4. The pressure class number in Tables 1-1 and 1-1S denotes construction suitable for a maximum level not less than the maximum operating pressure in the portion of the system receiving the classification from the designer.

Text references for ducts:

- a) Rectangular.....page 1-12
- b) Round.....page 3-2
- c) Flat oval.....page 3-13
- d) Flexible.....page 3-15
- e) Duct liner.....page 2-24

TABLE 1-1S STATIC PRESSURE		
Duct Pressure Class		Operating Pressure
(in.)	(Pa)	
1/2" w.g.	125	Up to 1/2" w.g.
1" w.g.	250	Over 1/2" up to 1" w.g.
2" w.g.	500	Over 1" up to 2" w.g.
3" w.g.	750	Over 2" up to 3" w.g.
4" w.g.	1000	Over 3" up to 4" w.g.
6" w.g.	1500	Over 4" up to 6" w.g.
10" w.g.	2500	Over 6" up to 10" w.g.

5. Designer selection of duct construction pressure class is acknowledgment of acceptable design velocity level and pressure level including any overpressure or underpressure conditions that may occur during normal and special modes of operation.
6. The designation of a pressure class pertains to straight duct and duct fittings except for equipment and special components inserted into the ductwork systems; such items are governed by separate specifications in the contract documents.



PRECAUTIONS FOR TABLE 1-1:

1. The construction is, as indicated elsewhere in this manual, qualified by freedom from structural failure; however, accidental overpressure that could occur must be provided for at the design stage by overpressure relief (such as fail safe features, replaceable relief panels, controlled failure points, etc.)
2. Field tests (if ever used) to test structural adequacy should not exceed 125% of rated pressure. The assignment of a pressure class number less than

The numerical value of the anticipated operating pressure involves risk.

3. Leakage test pressure should not exceed duct pressure class level.
4. Short-cycle pressure changes in duct systems can cause temporary noise. This is normally acceptable at system start-up and shutdown. To reduce or eliminate this noise, the designer must specify shorter-interval bracing, diagonal bracing, lagging, or other control means.



Duct Sealing Requirements Table 1-2

Seal Class	Sealing Required	Static Pressure Construction Class
A	All Transverse Joints Longitudinal Seams and Duct Wall Penetrations	4"W.G. AND UP
B	All Transverse Joint and Longitudinal Seams	3"W.G.
C	Transverse Joints	2"W.G.

IN ADDITION TO THE ABOVE, ANY VARIABLE AIR VOLUME SYSTEM DUCT OF 1½"W.G. CONSTRUCTION CLASS THAT IS UPSTREAM OF THE VAV BOXES SHALL ALSO MEET SEAL CLASS C.



SHEET METAL STANDARDS

DUCT GAUGE AND ENFORCING FOR 1" ESS & DRIVE (+/-)

DUCT DIMENSION	GAUGE OF METAL				JOINT CONSTRUCTIO	REINFORCING
	5' JOIN	4' JOIN	2.5' JOIN	2' JOIN		
0-12"	26	26	26	26	FLAT ESSES & DRIVE	NONE
13-30"	26	26	26	26	1"st ESSES & DRIVE	NONE
31-48"	24	24	24	26	1"st ESSES & DRIVE	NONE
49-60"	22	22	24	24	1"st ESSES & DRIVE	NONE
61-72"	22	22	22 no Cnt. ref	22 no Cnt. ref	TDF	NONE
73-96"	22	22	22 no Cnt. ref	22 no Cnt. Ref	TDF CNT-JNT	NONE
97-up	18	18	20 no Cnt. ref	20 no Cnt. ref	TDF CNT-JNT 48" MAX SPACING	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER

- NOTES: 1. TDC DUCT CONSTRUCTED PER SMACNA STANDARDS-FIRST EDITION 1995
 2. DUCT FABRICATED USING SNAPLOCK SEAMS.
 3. ALL DUCT STIFFENED BY MACHINE FORMED BEADS SPACED AT 12" O.C.
 4. DUCT WORK TO BE SEALED PER SMACNA HVAC TABLE 1-2
 5. TDC CNT-JNT-CONDU-LOC @ TDC CONNECTOR CENTER OF DUCT & @ TDC CONNECTOR



SHEET METAL STANDARDS

DUCT GAUGE AND ENFORCING FOR 1" ESS & DRIVE (+/-) HEAVY GA METAL						
DUCT DIMENSIONS	GAUGE OF METAL				JOINT CONSTRUCTION	REINFORCING
	5' JOINT	4' JOINT	2.5' JOINT	2' JOINT		
0-12"	26	26	26	26	FLAT ESSES & DRIVE	NONE
13-30"	24	24	24	24	1"st ESSES & DRIVE	NONE
31-54"	22	22	22	22	1"st ESSES & DRIVE	NONE
55-60"	20	20	20	20	1"st ESSES & DRIVE	NONE
61-72"	20	20	20 no Cnt. ref	20 no Cnt. ref	TDF	NONE
73-84"	20	20	20 no Cnt. ref	20 no Cnt. Ref	TDF	NONE
85-up	18	18	20 no Cnt. ref	20 no Cnt. ref	TDF CNT-JNT 48" MAX SPACING	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE

- NOTES: 1. TDC DUCT CONSTRUCTED PER SMACNA STANDARDS-FIRST EDITION 1995
 2. DUCT FABRICATED USING PITTSBURG SEAMS.
 3. ALL DUCT STIFFENED BY MACHINE FORMED BEADS SPACED AT 12" O.C.
 4. DUCT WORK TO BE SEALED PER SMACNA HVAC TABLE 1-2
 5. TDC CNT-JNT-CONDU-LOC @ TDC CONNECTOR CENTER OF DUCT & @ TDC CONNECTOR



SHEET METAL STANDARDS

DUCT GAUGE AND ENFORCING FOR 1" W. G. (+/-) TDF

DUCT DIMENSIONS	GAUGE OF METAL				JOINT CONSTRUCTION	REINFORCING
	5' JOINT	4' JOINT	2.5' JOINT	2' JOINT		
0-12"	26	26	26	26	HEMMED "S" & DRIVE	NONE
12-36"	26	26	26	26	TDF	NONE
37-48"	24	24	24	26	TDF	NONE
49-60"	22	22	24	24	TDF	NONE
61-72"	22	22	22 no Cnt. ref	22 no Cnt. ref	TDF CNT-JNT	NONE
73-96"	22	22	22 no Cnt. ref	22 no Cnt. Ref	TDF CNT-JNT	NONE
97-up	18	18	20 no Cnt. ref	20 no Cnt. ref	TDF CNT-JNT 48" MAX SPACING	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER

- NOTES: 1. TDC DUCT CONSTRUCTED PER SMACNA STANDARDS-FIRST EDITION 1995
 2. DUCT FABRICATED USING PITTSBURG SEAMS.
 3. ALL DUCT STIFFENED BY MACHINE FORMED BEADS SPACED AT 12" O.C.
 4. DUCT WORK TO BE SEALED PER SMACNA HVAC TABLE 1-2
 5. TDC CNT-JNT-CONDU-LOC @ TDC CONNECTOR CENTER OF DUCT & @ TDC CONNECTOR



SHEET METAL STANDARDS

DUCT GAUGE AND ENFORCING FOR 2" W. G. (+/-)

DUCT DIMENSIONS	GAUGE OF METAL				JOINT CONSTRUCTION	REINFORCING
	5' JOINT	4' JOINT	2.5' JOINT	2' JOINT		
0-12	26	26	26	26	HEMMED "S" & DRIVE	NONE
13-24"	26	26	26	26	TDF	NONE
25-30"	24	24	26	26	TDF	NONE
31-36"	22	24	26	26	TDF	NONE
37-42"	20	24	24	24	TDF	NONE
43-48"	20	22	24	24	TDF	NONE
49-54	22	22	24 no Cnt. ref	24 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER
55-60"	22	22	22 no Cnt. ref	22 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER
61-84"	22	22	22 no Cnt. ref	22 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER
85-96"	20	20	20 no Cnt. ref	20 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER
97-up	18	18	18 no Cnt. ref	18 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 16GA V- TYPE STIFFENER

- NOTES: 1. TDC DUCT CONSTRUCTED PER SMACNA STANDARDS-FIRST EDITION 1995
 2. DUCT FABRICATED USING PITTSBURG SEAMS.
 3. ALL DUCT STIFFENED BY MACHINE FORMED BEADS SPACED AT 12" O.C.
 4. DUCT WORK TO BE SEALED PER SMACNA HVAC TABLE 1-2
 5. TDC CNT-JNT-CONDU-LOC @ TDC CONNECTOR CENTER OF DUCT & @ TDC CONNECTOR



SHEET METAL STANDARDS

DUCT GAUGE AND ENFORCING FOR 3" W. G. (+/-)

DUCT DIMENSION	GAUGE OF METAL				JOINT CONSTRUCTION	REINFORCING
	5' JOINT	4' JOINT	2.5' JOINT	2' JOINT		
0-12"	24	24	24	24	HEMMED "S" & DRIVE	NONE
13-26"	24	24	24	24	TDF	NONE
27-30"	22	24	24	24	TDF	NONE
31-42"	20	22	24	24	TDF	NONE
43-48"	24	24	24 no Cnt. ref	24 no Cnt. ref	TDF	1 ½ WIDE X 1 ½ HIGH 18GA V-TYPE STIFFENER
49-60"	22	22	24 no Cnt. ref	24 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V-TYPE STIFFENER
61-72"	22	22	22 no Cnt. ref	22 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V-TYPE STIFFENER
73-84"	20	20	20 no Cnt. ref	20 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V-TYPE STIFFENER
85-96"	18	18	18 no Cnt. ref	20 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V-TYPE STIFFENER
97-up	18	18	18 no Cnt. ref	18 no Cnt. ref	TDF CNT-JNT 48" MAX SPACING	1 ½ WIDE X 1 ½ HIGH 16GA V-TYPE STIFFENER

- NOTES: 1. TDC DUCT CONSTRUCTED PER SMACNA STANDARDS-FIRST EDITION 1995
 2. DUCT FABRICATED USING PITTSBURG SEAMS.
 3. ALL DUCT STIFFENED BY MACHINE FORMED BEADS SPACED AT 12" O.C.
 4. DUCT WORK TO BE SEALED PER SMACNA HVAC TABLE 1-2
 5. TDC CNT-JNT-CONDU-LOC @ TDC CONNECTOR CENTER OF DUCT & @ TDC CONNECTOR



SHEET METAL STANDARDS

DUCT GAUGE AND ENFORCING FOR 4" W. G. (+/-)

DUCT DIMENSIONS	GAUGE OF METAL				JOINT CONSTRUCTION	REINFORCING
	5' JOINT	4' JOINT	2.5' JOINT	2' JOINT		
0-8"	24	24	24	24	HEMMED "S" & DRIVE	NONE
9-22"	24	24	24	24	TDF	NONE
23-30"	22	24	24	24	TDF	NONE
31-36"	20	22	24	24	TDF	NONE
37-42"	24	24	24 no Cnt. ref	24 no Cnt. ref	TDF	1 ½ WIDE X 1 ½ HIGH 18GA V-TYPE STIFFENER
43-48"	22	22	22 no Cnt. ref	22 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V-TYPE STIFFENER
49-60"	22	22	22 no Cnt. ref	22 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V-TYPE STIFFENER
61-72"	20	20	20 no Cnt. ref	20 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V-TYPE STIFFENER
73-84"	18	18	18 no Cnt. ref	20 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V-TYPE STIFFENER
85-96"	20 2 SETS Cnt. ref	20	20	20 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 16GA V-TYPE STIFFENER
97-up	18	18	18 no Cnt. ref	18 no Cnt. ref	TDF CNT-JNT 48" MAX SPACING	1 ½ WIDE X 1 ½ HIGH 16GA V-TYPE STIFFENER

- NOTES: 1. TDC DUCT CONSTRUCTED PER SMACNA STANDARDS-FIRST EDITION 1995
 2. DUCT FABRICATED USING PITTSBURG SEAMS.
 3. ALL DUCT STIFFENED BY MACHINE FORMED BEADS SPACED AT 12" O.C.
 4. DUCT WORK TO BE SEALED PER SMACNA HVAC TABLE 1-2
 5. TDC CNT-JNT-CONDU-LOC @ TDC CONNECTOR CENTER OF DUCT & @ TDC CONNECTOR



SHEET METAL STANDARDS

DUCT GAUGE AND ENFORCING FOR 6" W. G. (+/-)

DUCT DIMENSIONS	GAUGE OF METAL				JOINT CONSTRUCTION	REINFORCING
	5' JOINT	4' JOINT	2.5' JOINT	2' JOINT		
0-8"	24	24	24	24	HEMMED "S" & DRIVE	NONE
9-12"	24	24	24	24	TDF	NONE
13-22"	22	24	24	24	TDF	NONE
23-24"	22	22	24	24	TDF	NONE
25-28"	20	22	24	24	TDF	NONE
29-36"	24	24	24 no Cnt. ref	24 no Cnt. ref	TDF	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER
37-42"	22	22	22 no Cnt. ref	22 no Cnt. ref	TDF	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER
43-48"	20	20	20 no Cnt. ref	20 no Cnt. ref	TDF	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER
49-60"	20	20	20 no Cnt. ref	22 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER
61-72"	18	18	18 no Cnt.ref	20 no Cnt. ref	TDF CNT-JNT	1 ½ WIDE X 1 ½ HIGH 18GA V- TYPE STIFFENER
73-96"	18 2 SETS Cnt. ref	18	18	20 no Cnt. ref	TDF CNT-JNT 48" MAX SPACING	1 ½ WIDE X 1 ½ HIGH 16GA V- TYPE STIFFENER
97-up	18 2 SETS Cnt.ref	18	18	18 no Cnt. Ref	TDF CNT-JNT 48" MAX SPACING	1 ½ WIDE X 1 ½ HIGH 16GA V- TYPE STIFFENER

- NOTES: 1. TDC DUCT CONSTRUCTED PER SMACNA STANDARDS-FIRST EDITION 1995
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 5. TDC CNT-JNT-CONDU-LOC @ TDC CONNECTOR CENTER OF DUCT & @ TDC CONNECTOR



KITCHEN EXHAUST DUCTS

Single Wall Grease Ducts:

Concealed Grease Ducts: Grease ducts shall be constructed of black steel complying with ASTM A 527, minimum 16 Gauge., constructed in accordance with SMACNA's *HVAC Duct Construction Standards-Metal and Flexible*. Provide fire resistant duct insulation for all grease ductwork, unless otherwise indicated. Include all components to comply with NFPA 96, including cleanouts, transitions, adapters, and drain fitting. Weld all joints to provide liquid-tight seal.

Exposed Grease Ducts: Grease ducts shall be constructed of minimum 19 Gauge Type 316L stainless steel with No. 4 finish complying with ASTM A 480, constructed in accordance with SMACNA's *HVAC Duct Construction Standards-Metal and Flexible*. Include all components to comply with NFPA 96, including cleanouts, transitions, adapters, and drain fitting. Weld all joints to provide liquid-tight seal.

M.S. Gage	Weight lb/sf (kg/m ²)	Thickness				ANSI STANDARD B32.3 Preferred in Thickness Millimeters		
		Nominal	Hot Rolled		Cold Rolled		First	Second
			Min.	Max.	Min.	Max.		
28	.625 (3.051)	.0149 in .378 mm			.0129 in .328 mm	.0169 in .429 mm	.30	.35
26	.750 (3.661)	.0179 in .455 mm			.0159 in .404 mm	.0199 in .505 mm	.40	.45
24	1.000 (4.882)	.0239 in .607 mm			.0209 in .531 mm	.0269 in .683 mm	.50	
22	1.250 (6.102)	.0299 in .759 mm			.0269 in .683 mm	.0329 in .826 mm	.60	.65
20	1.500 (7.232)	.0359 in .912 mm			.0329 in .836 mm	.0389 in .988 mm	.80	.90
18	2.000 (9.764)	.0478 in 1.214 mm	.0428 in 1.087 mm	.0528 in 1.341 mm	.0438 in 1.113 mm	.0518 in 1.316 mm	1.00	1.10
16	2.500 (12.205)	.0598 in 1.519 mm	.0538 in 1.367 mm	.0658 in 1.649 mm	.0548 in 1.392 mm	.0548 in 1.649 mm	1.6	1.8
14	3.125 (15.256)	.0747 in 1.897 mm	.0677 in 1.720 mm	.0817 in 2.075 mm	.0697 in 1.770 mm	.0797 in 2.024 mm	2.0	2.2
12	4.125 (21.359)	.1046 in 2.657 mm	.0966 in 2.454 mm	.112 in 2.860 mm	.0986 in 2.504 mm	.1106 in 2.809 mm	3.0	3.2
10	5.625 (27.461)	.1345 in 3.416 mm	.1265 in 3.213 mm	.1425 in 3.619 mm	.1285 in 3.264 mm	.1405 in 3.569 mm	4.0	3.8
8	6.875 (33.564)	.1644 in 4.176 mm	.1564 in 3.973 mm	.1724 in 4.379 mm				

Manufacturers Standard Gage-Thickness—Uncoated Steel



TECHNICAL DATA SHEET – STAINLESS SHEETS – T 304

Below are typical chemistry ranges set forth in the ASTM Standard A240
Compositions, %-Heat Analysis Element, max.

COMPOSITION WT. %:

Mn: 2.00 max	Cr: 17.5 min - 19.5 max	Ni: 8.0 min - 10.5 max	Si: 0.75 max	N: 0.10 max
P: 0.045 max	S: 0.030 max	Fe: balance		

TYPICAL MECHANICAL PROPERTIES:

Density lb/in ³ (g/cm ³)	Tensile Strength ksi (MPa):	0.2% Yield Strength ksi (MPa):	Elongation:	Hardness:
.0285 (7.90)	75 min (515 min)	30 min (205 min)	40% min	92 HRB max
.0285 (7.90)	75 min (515 min)	30 min (205 min)	40% min	92 HRB max
.0285 (7.90)	75 min (515 min)	30 min (205 min)	40% min	92 HRB max

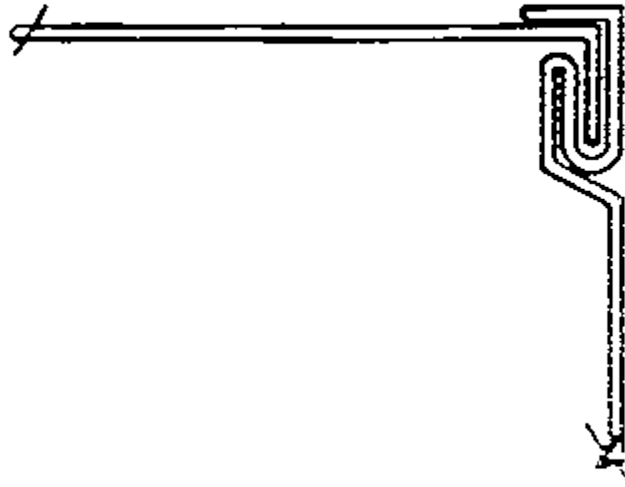
304 – Austenitic stainless steels. The 300 series alloys contain chromium and nickel as their major alloying additions. Type 304 (also known as 18-8) is the most widely used of all stainless steel alloys. They also exhibit high hardness and high yield strength as well as excellent ductility and are non magnetic in the annealed condition. 304 offers good corrosion resistance and superior resistance to intergranular corrosion following welding or stress relieving. 304 stainless sheet is available in the common 2B finish and # 4 finish polished to achieve “brushed” finish.

HB Steel Standard Surface: Dry – Silver Metallic
Product/Common Name: Stainless Sheet

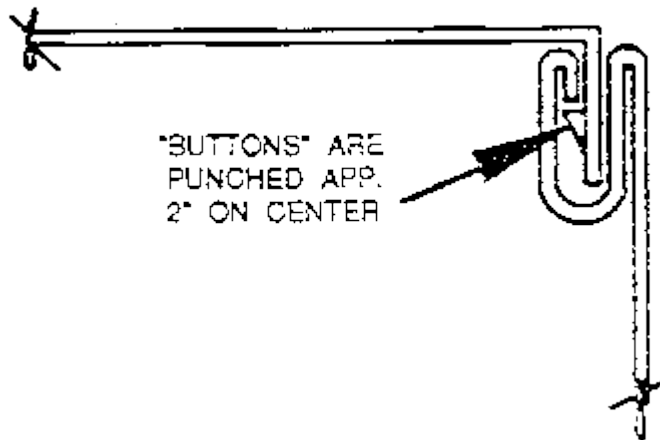
Weldability – Excellent (specify 304L for heavy welded sections to avoid post weld annealing requirements)
Machinability – Excellent
Bending/forming/stamping - Good
Corrosion resistance – Good

We hereby certify that the foregoing data is typical of the data furnished us by the producing mill or the data resulting from tests performed in the laboratory.

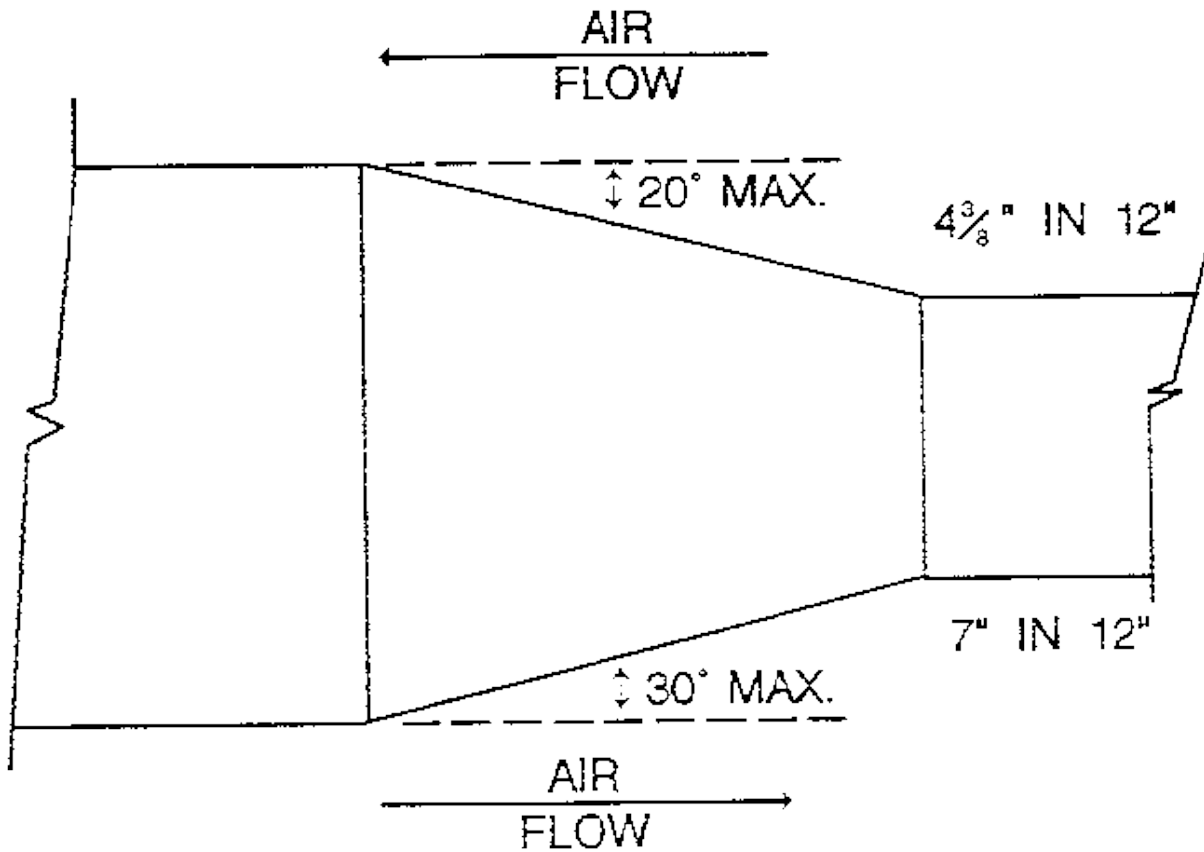
LONGITUDINAL SEAMS



PITTSBURGH LOCK

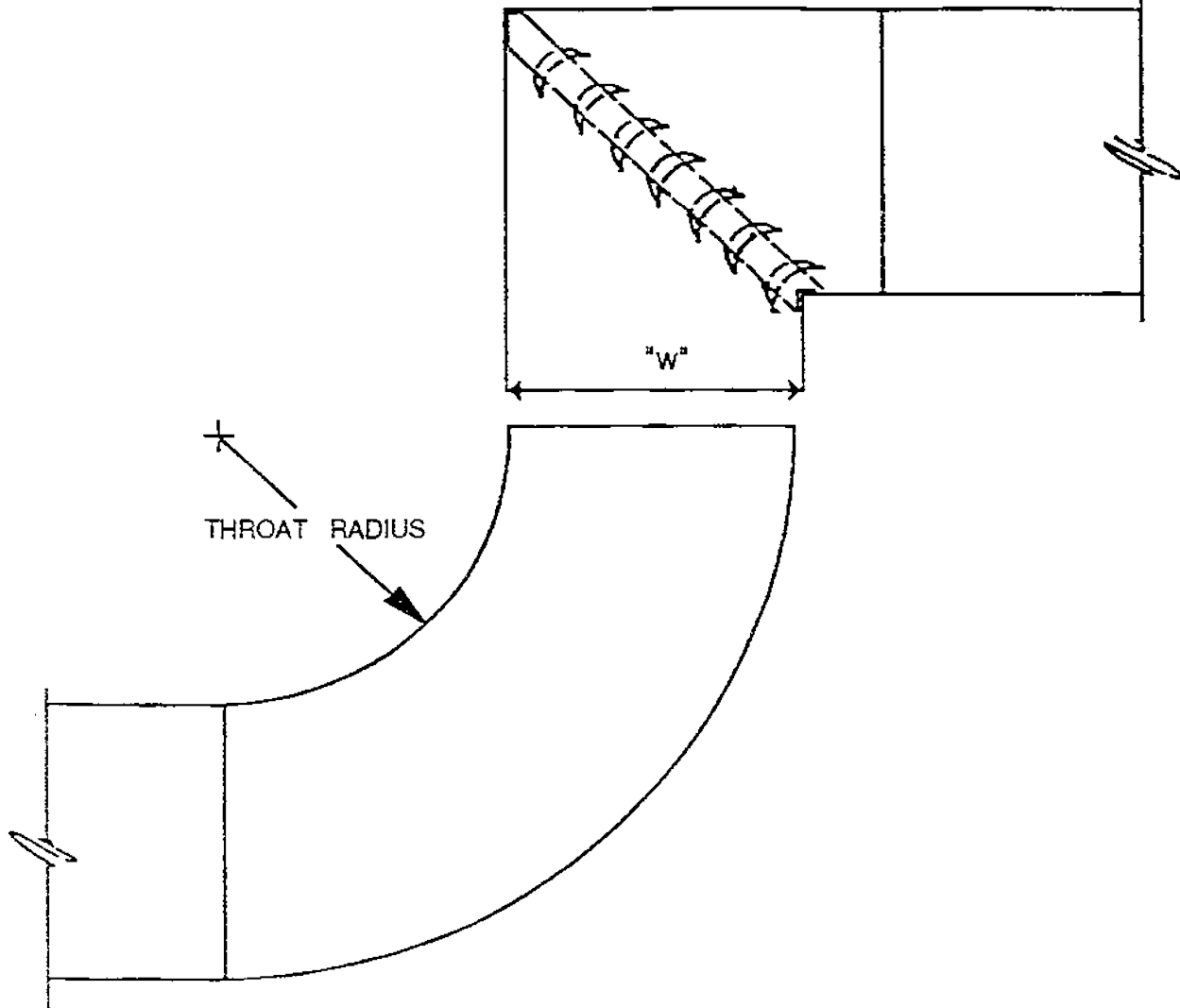


BUTTON-PUNCH SNAP-LOCK



NOTES

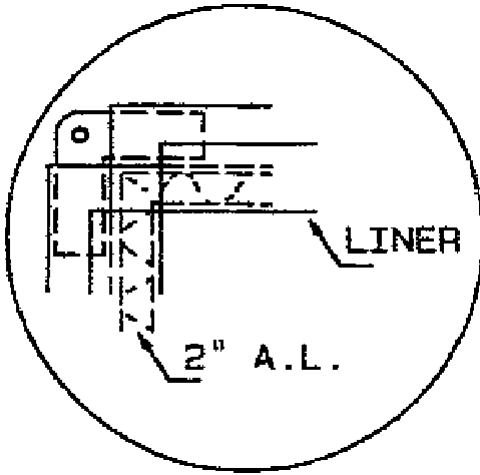
ELBOW CONSTRUCTION



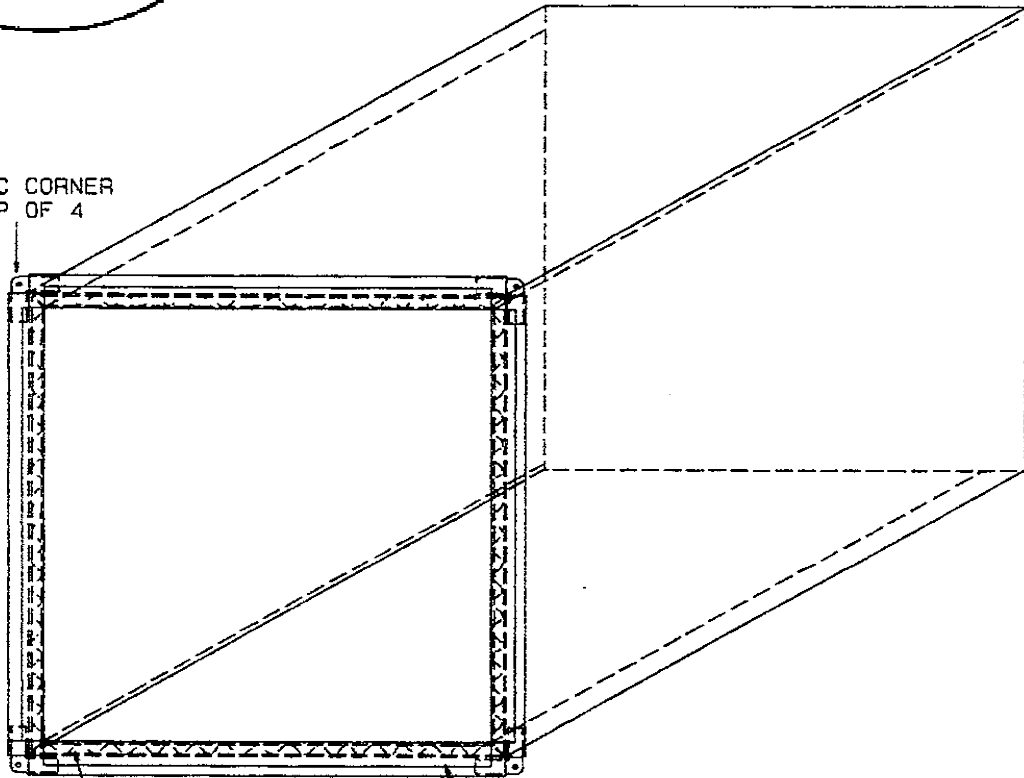
NOTES:

1. All square elbows will have turning vanes installed.
2. All radius elbows will have a throat-radius equal to "W".
3. Radius elbows will be used anywhere space permits.

INTERIOR DUCT LINER (SOUND ABSORBERS)



TDC CORNER
TYP OF 4

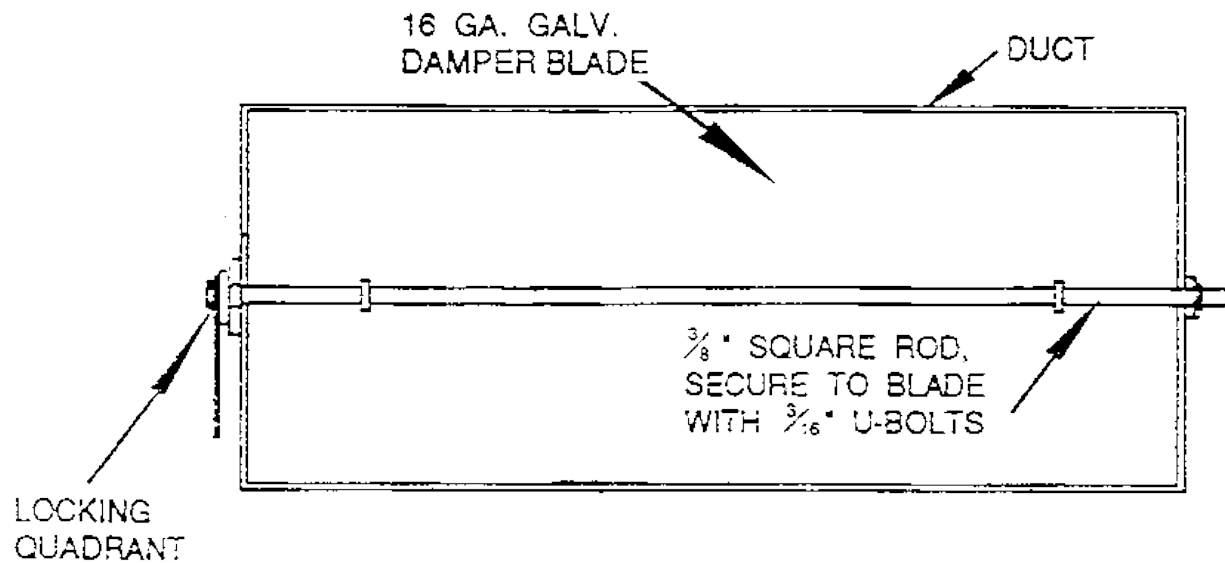


2"-2# DENSITY
ACOUSTICAL
LINER

PERFORATED
LINER LAPPED
OVER TRANSVERSE
DUCT CONNECTOR
(TDC)

REFERENCE SPECIFICATION SECTION 15895-2.4F

SINGLE-BLADE VOLUME DAMPER



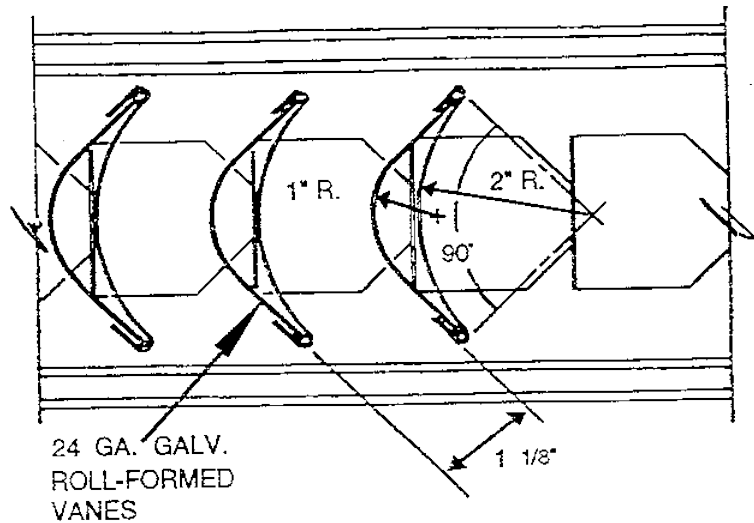
NOTES:

1. Over 12" High use multiple Blade Dampers.
2. Quadrant to be Ventfabric No. 635.

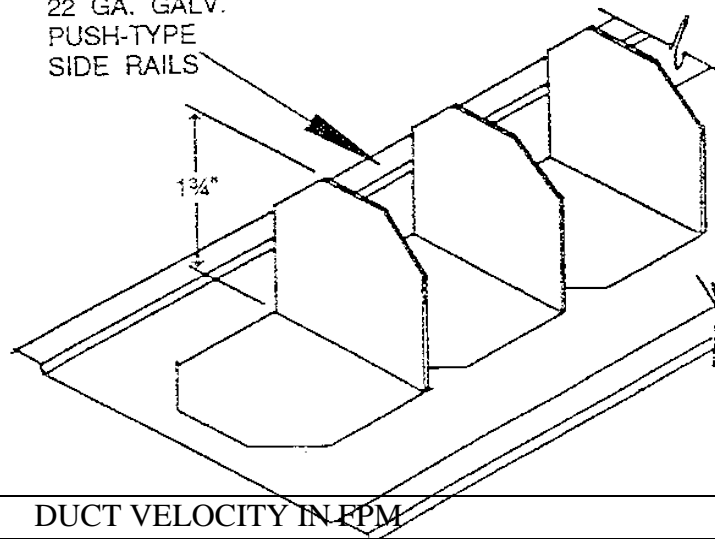
2" ROLL-FORMED AIR TURNING VANES

NOTE-TURNING VANES WILL BE TACK-WELDED TO RUNNERS FOR H.P. APPLICATIONS

Turning Vanes are non-adjustable 90° air turns designed to reduce the pressure loss in square duct elbows. The galvanized steel blades are double walled and formed to assure that any point on one blade is equidistant from the same point on an adjacent blade. This precise blade shape maintains constant duct area and assures constant air velocity around the ell, eliminates loss due to velocity changes and results in low friction loss. The blade is rigid and eliminates the need for cross bracing or reinforcing rods. Roll-formed from coils of sheet metal, surfaces and edges are smooth and free from edge friction and blade turbulence. Blades assemble over precision-formed tenons on the runners, which insures precise blade alignment, and proper spacing, and predictable engineering performance. The complete unit is screwed or riveted into the duct ell.

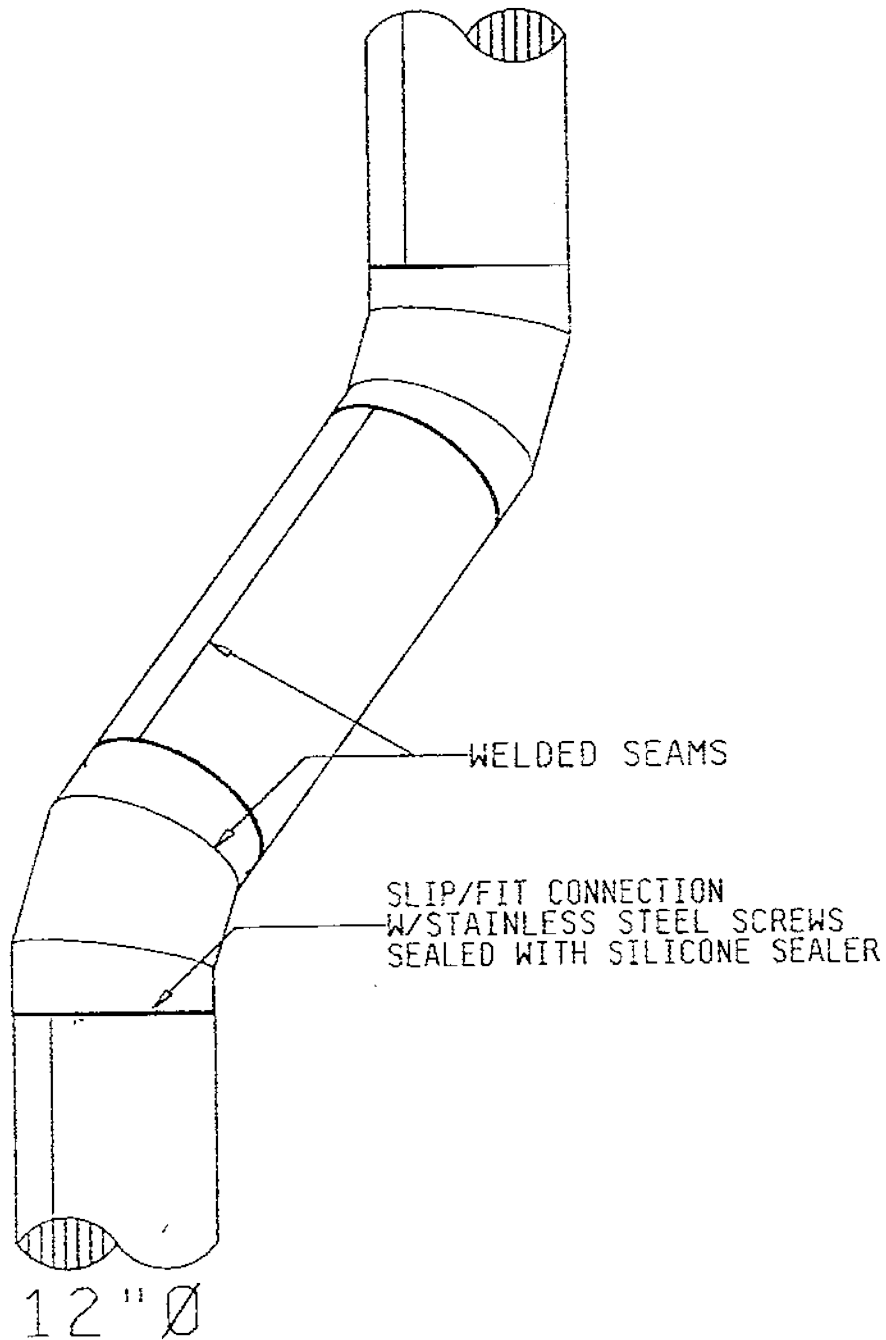


24 GA. GALV.
ROLL-FORMED
VANES



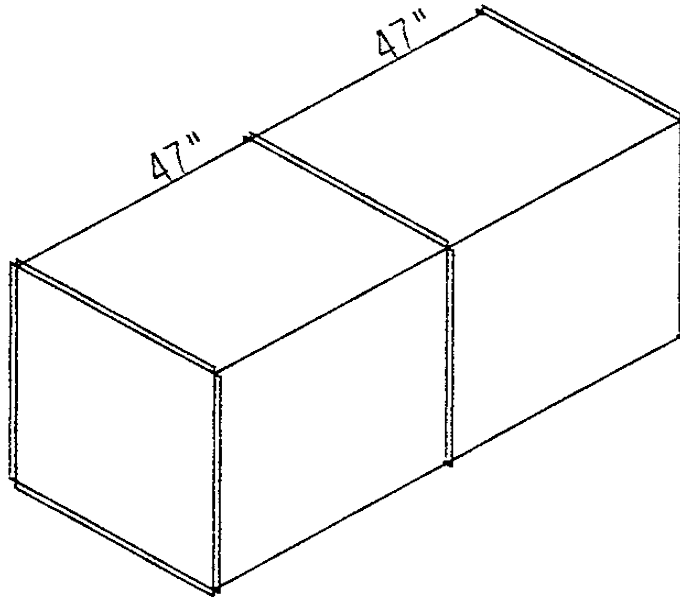
TYPE OF ELL	DUCT VELOCITY IN FPM					
	500	1000	1500	2000	2500	3000
DUCTURNS	.01	.02	.04	.07	.11	.16
NO VANES	.02	.08	.19	.35	.52	.75

SINGLE-BLADE VOLUME DAMPER



18 GA WELDED STAINLESS STEEL DISHWASHER EXHAUST DUCT

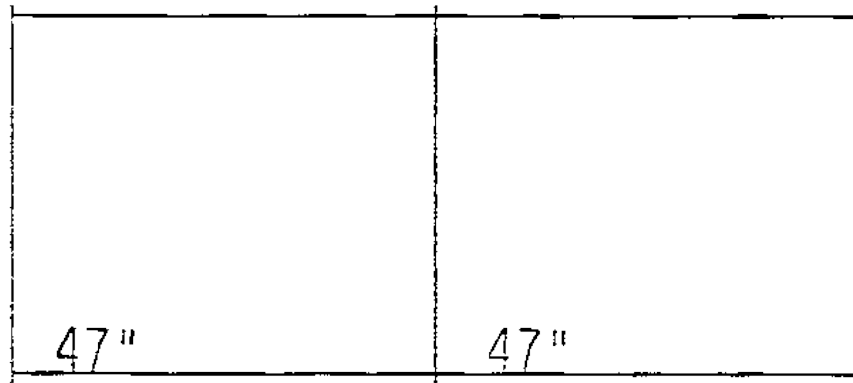
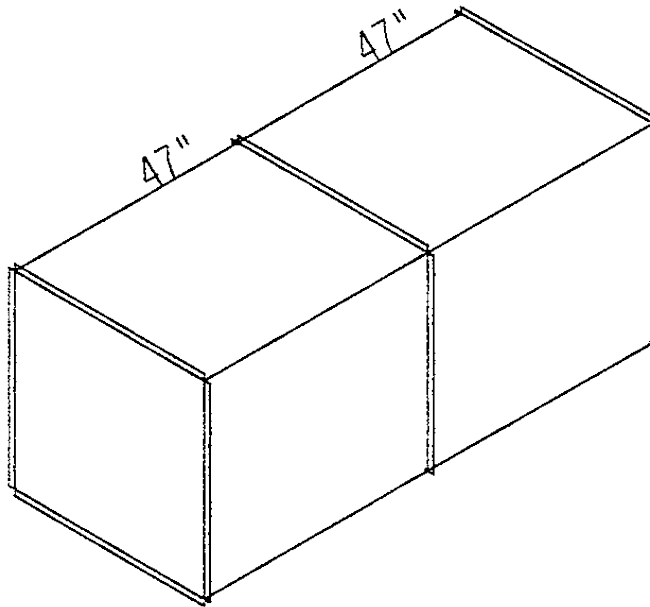
ALL SEAMS, JOINTS, AND
PENETRATIONS TO HAVE
CONTINUOUS EXTERNAL
WELDS. (TYPICAL)



REFERENCE SPECIFICATION SECTION 15890

16 GA WELDED BLACK IRON KITCHEN EXHAUST DUCT

ALL SEAMS, JOINTS, AND PENETRATIONS TO HAVE CONTINUOUS EXTERNAL WELDS. (TYPICAL)



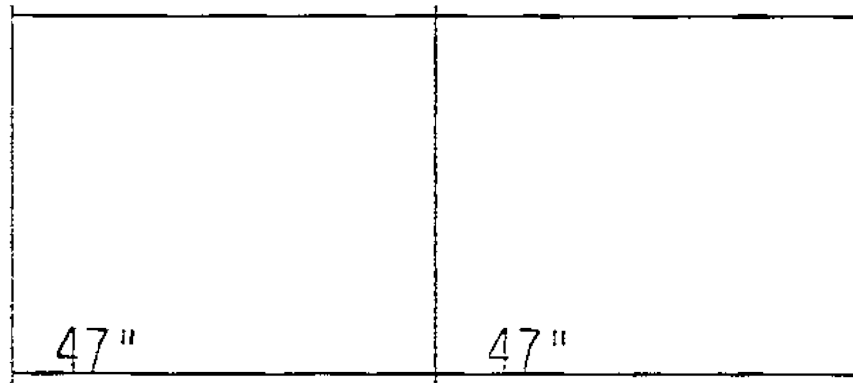
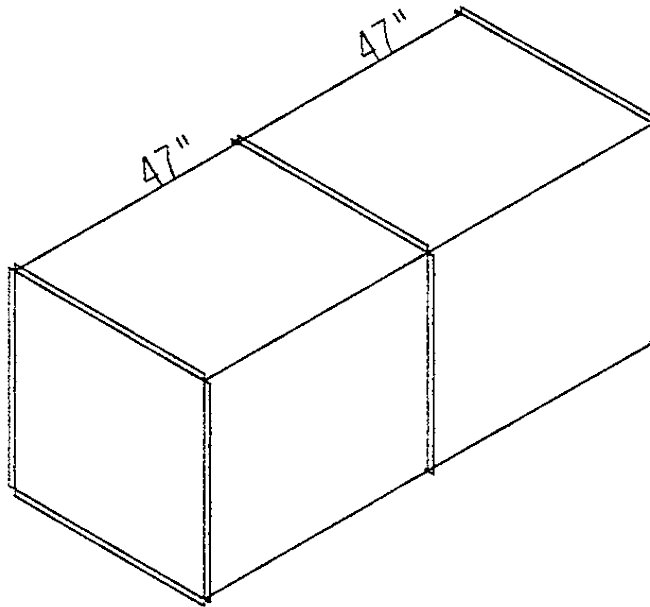
SLOPE TOWARDS EXHAUST CONNECTION



REFERENCE SPECIFICATION SECTION 15872

16 GA WELDED STAINLESS STEEL KITCHEN & DISHWASHER DUCT

ALL SEAMS, JOINTS, AND PENETRATIONS TO HAVE CONTINUOUS EXTERNAL WELDS. (TYPICAL)



SLOPE TOWARDS EXHAUST CONNECTION



SUBMITTAL RECORD

JOB _____
 LOCATION _____
 SUBMITTED TO _____
 SUBMITTAL PREPARED BY _____
 APPROVED BY _____
 DATE _____



Specification Form
FFF Excelon
Flexible Duct Connector

DESCRIPTION

All air duct installations for heating, cooling or ventilation are attached to mechanical equipment containing a fan or blower. Vibrations, noises and rattles resulting from operation of the fan or blower are transmitted into the metal ducts which carry the noise throughout the system.

In order to isolate the vibration and noises to the source, an air-tight flexible joint, consisting of a fabric which is attached to sheet metal on both sides, must be inserted between the equipment and the ductwork. This vibration isolator is called a "Flexible Duct Connector".



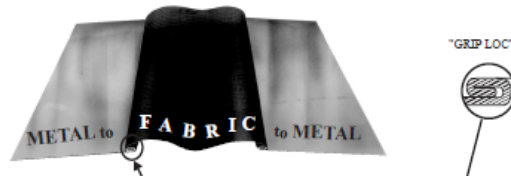
RELATED NFPA 90A & 90B STANDARDS

2-3.2.2 Vibration isolation connectors in duct systems shall be made of an approved flame-retardant fabric or shall consist of sleeve joints with packing of approved material, each having a maximum flame spread index of 25 and a maximum smoke developed index of 50. Exception: Approved flame-retardant fabric having a maximum length of 10 in. (45.4 cm) in the direction of airflow-NFPA No. 90A 1999

2-1.1.1 Exception No. 3: Vibration isolation connectors in duct systems shall be made of approved flame-retardant fabric or shall consist of sleeve joints with packing of approved noncombustible material. The fabric shall not exceed 10 in. (254 mm) in length in direction of airflow-NFPA No. 90B 1999

FABRIC	Excelon ⁴
Continuous Temp. Range	-40°F. to 180°F.
Color	Black
Weight Per Square Yard	17 oz.
Leakage Resistance ¹	350
Tear Strength ²	100/100
Tensile Strength ³	240/220
Base Fabric	Woven Nylon/Polyester Blend
Coating	Vinyl
Features	High Tear Strength High Abrasion Resistance
Codes Metal-Fab 3x3x3 Grip Loc	FFF333 (#10266)
Super Metal-Fab 3x6x3 Grip Loc	FFF363 (#10268)
TDC/TDF 4x4x4 Grip Loc	FFF444 (#10267)

All Metal-Fab, Super Metal-Fab and TDC/TDF Flexible Duct Connectors are manufactured with 24 gauge galvanized steel.



Notes:

1. Leakage resistance as per Federal Test Standard 191 Method #5512. Results in P.S.I. (To convert inches of water multiply P.S.I. x 27.176).
2. Tear strength in tongue pounds as per Federal Test Standard 191 Method #5134.1 (warp/fill).
3. Tensile strength in grab pounds as per Federal Test Standard 191 Method #5100 (warp/fill).
4. Standard Excelon is not LA city approved. Use Excelon-LA when LA city approval is necessary. (See Specification Form Excelon-LA - 203)

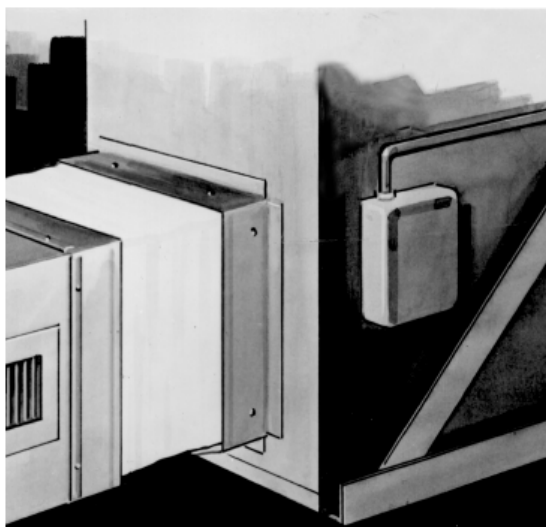
SUGGESTED SPECIFICATION

Vibration Isolating Flexible Duct Connector For Heating, Cooling & Exhaust Supplies & Returns.

At the inlet and discharge of all air handling equipment(unless otherwise noted) furnish and install vibration isolators. Vibration isolators shall be a coated woven fabric named _____ and shall be "Underwriters Laboratories Classified".

Vibration isolators shall have a tear strength of not less than _____, and a continuous temperature range of _____. Vibration isolators shall be preassembled metal to exposed fabric to metal. Fabric and metal shall be joined by means of a double lock seam.

Vibration isolators shall be code _____ (called Flexible Duct Connectors) as manufactured by Duro Dyne Corporation, Bay Shore, N.Y.



Specifications

All Listed Duro Dyne Flexible Duct Connector Fabrics are designed to meet the following specifications:

1. MIL-C-20696B Para. 4.4.3. (Oil Resistance).
2. MIL-C-20696B Para. 4.4.4. (Hydro Carbon Resistance).
3. NFPA 90A Installation of Air Conditioning and Ventilating Systems Para. 2-3.2.2 1999 Edition.
4. NFPA 90B Warm air heating and air conditioning systems. Para. 2-1.1.1 exc. no 3 1999 Edition.
5. NFPA701 Tests for Flame Propagation of Fabrics and film.
6. California State Fire Marshal Approved.
7. Los Angeles City Approved. (See note 1 below)
8. Denver City Approved.

All Duro Dyne Flexible Duct Connectors utilize galvanized steel meeting ASTM-A-525 G 60 or better.

Note 1 - Standard Excelcon is not LA city approved. Use Excelcon-LA when LA city approval is necessary. (See Specification Form Excelcon-LA - 203)

CHEMICAL RESISTANCE

(X = Extremely Resistant)

(~ = Not Recommended)

(O = No Data Available)

Chemical	Excelcon	Chemical	Excelcon
Acetic Acid	~	Hydrofluoric Acid (100%)	~
Aluminum Chloride	X	Hydrogen Peroxide	X
Aluminum Sulfate	X	Hydrogen Sulfide	X
Ammonia (Anhyd)	X	Lactic Acid	~
Ammonium Hydroxide	X	Linseed Oil	~
Ammonium Sulfate	X	Magnesium Chloride	~
Barium Sulfide	X	Maleic Acid	X
Black Sulfate Liquor	X	Methyl Alcohol	~
Boric Acid	X	Methyl Cellosolve	~
Butyl Alcohol	~	Mineral Oil	X
Cadmium Plating Solution	X	Naptha	~
Calcium Chloride	X	Nickel Chloride	X
Calcium Hypochlorite	X	Nickel Sulfate	X
Chlorine Water	X	Nitric Acid (40%)	X
Chromic Acid	X	Oleic Acid	X
Chromium Plating Solution	X	Oleum	~
Citric Acid	X	Oxalic Acid	X
Copper Chloride	X	Phosphoric Acid (85%)	~
Copper Sulfate	X	Pickling Solution	X
Cottonseed Oil	X	Potassium Chloride	X
Diacetone Alcohol	~	Potassium Cyanide	X
Disodium Phosphate	X	Potassium Dichromate	X
Ethyl Alcohol	~	Potassium Hydroxide (40%)	X
Ethylene Glycol	~	Potassium Sulfate	X
Ferric Chloride	X	Propyl Alcohol	~
Ferric Sulfate	X	Sodium Chloride	X
Fluoroboric Acid	X	Sodium Hydroxide (40%)	~
Formaldehyde (40%)	X	Sodium Hypochlorite	~
Formic Acid	X	Steam	~
Glucose	X	Sulfur Dioxide (Liquid)	~
Glycerine	~	Sulfuric Acid (50%)	X
Heptane	~	Sulfuric Acid (over 50%)	~
Hexane	~	Tannic Acid	X
Hydrobromic Acid (40%)	~	Vinegar	X
Hydrochloric Acid (conc)	~		

Duro Dyne East Division, Bay Shore, NY
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SUBMITTAL RECORD _____
 JOB _____
 LOCATION _____
 SUBMITTED TO _____
 SUBMITTAL PREPARED BY _____
 APPROVED BY _____
 DATE _____



Submittal Form Neoprene Gasket



DESCRIPTION

Wherever flanges are used in connecting parts of a duct system, the potential for air leakage exists. Besides contributing to energy waste, leaks can also create noise. Sealing of ductwork can be accomplished with the use of neoprene gasket which adheres to flanged surfaces. When this material is attached to a flange which is then assembled to a second flange, the material is compressed and fills gaps and irregularities creating a seal.

FEATURES

- Excellent resistance to oil and fuel
- Black, continuous, closed cell, medium density rubber product
- PVC/NBR/CR closed cell rubber material manufactured in continuous rolls

MEETS

- UL94 5VA, 5VB, V-0, V-1, HF-1 and HBF listed for flame
- ASTM D 1056-07 2A2/2C2/2B2 grade product
- ASTM D 6575-07 Type II, Grades A & B, Condition Soft-Medium material

TYPICAL PROPERTIES

Color: Black
Density: 88-120 kg/m³
Hardness: 50 + 10
Compression-Deflection @ 25%: 5 - 9 psi
Compression Set @ 50%: ≤ 25%
Water Absorption: < 10%
Fluid Immersion: < 100%
Tear Strength: 12 lbs./in.
Tensile Strength: 75 psi min.
Elongation: 100% min.
Flammability: FM VSS 302
 UL 94 V-0, 5 VA, HF-1, HBF
Temperature Use: -20°F - 160°F Max (200°F intermittent)

NEOPRENE

ITEM#	CODE	DESCRIPTION	LENGTH
8129	BN 1812	1/8" x 1/2"	50'/RL
8130	BN 1434	1/4" x 3/4"	50'/RL
8131	BN 3834	3/8" x 3/4"	25'/RL
8261	BN 31634	3/16" x 3/4"	50'/RL
8151	BN 51634	5/16" x 3/4"	50'/RL
8149	BN316-1	3/16" x 1"	50'/RL

SUGGESTED SPECIFICATIONS

All flanged joints shall be sealed with gasketing, coded _____ as supplied by Duro Dyne Corporation.

RELATED SMACNA RECOMMENDATIONS*

1.4.1 - Duct Sealing

Ducts must be sufficiently airtight to ensure economical and quiet performance of the system. It must be recognized that airtightness in ducts cannot, and need not, be absolute (as it must be in a water piping system). Codes normally require that ducts be reasonably airtight. Concerns for energy conservation, humidity control, space temperature control, room air movement, ventilation, maintenance, etc., necessitate regulating leakage by prescriptive measures in construction standards. Leakage is largely a function of static pressure and the amount of leakage in a system is significantly related to system size. Adequate airtightness can normally be ensured by a) selecting a static pressure, construction class suitable for the operating condition, and b) sealing the ductwork properly.

The designer is responsible for determining the pressure class or classes required for duct construction and for evaluating the amount of sealing necessary to achieve system performance objectives. It is recommended that all duct constructed for the 1 in. (250 Pa) and 1/2 in. (125 Pa) pressure class meet Seal Class C. However, because designers sometimes deem leakage in unsealed ducts not to have adverse effects, the sealing of all ducts in the 1 in. (250 Pa) and 1/2 in. (125 Pa) pressure class is not required by this construction manual. Designers occasionally exempt the following from sealing requirements: small systems, residential occupancies, ducts located directly in the zones they serve, ducts that have short runs from volume control boxes to diffusers, certain return air ceiling plenum applications, etc. When Seal Class C is to apply to all 1 in. (250 Pa) and 1/2 in. (125 Pa) pressure class duct, the designer must require this in the project specification. The designer should review the *HVAC Air Duct Leakage Test Manual* for estimated and practical leakage allowances.

Seven pressure classes exist [1/2 in. (125 Pa), 1 in. (250 Pa), 2 in. (500 Pa), 3 in. (750 Pa), 4 in. (1000 Pa), 6 in. (1500 Pa), and 10 in. wg (2500 Pa)]. If the designer does not designate pressure class for duct construction on the contract drawings, the basis of compliance with the SMACNA *HVAC Duct Construction Standards* is as follows: 2 in. wg (500 Pa) for all ducts between the supply fan and variable volume control boxes and 1 in. wg (250 Pa) for all other ducts of any application.

Some sealants can adversely affect the release function of breakaway connections to fire dampers; consult the damper manufacturer for installation restrictions.

Table 1-1 Standard Duct Sealing Requirements

Seal Class	Sealing Requirements	Applicable Static Pressure Construction Class
A	Class A: All Transverse joints, longitudinal seams, and duct wall penetrations	4 in. wg and up (1000 Pa)
B	Class B: All Transverse joints and longitudinal seams only	3 in. wg (750 Pa)
C	Class C: Transverse joints only	2 in. wg (500 Pa)

In addition to the above, any variable air volume systems duct of 1 in. (250 Pa) and 1/2 in. wg (125 Pa) construction class that is upstream of the VAV boxes shall meet Seal Class C

*From SMACNA *HVAC Duct Construction Standards Metal and Flexible • Third Edition • 2005*

Duro Dyne East Division, Bay Shore, NY
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 Duro Dyne West Division, Fontana CA
 Duro Dyne Canada, Lachine, Quebec, Canada

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 BO050029

SUBMITTAL RECORD

JOB _____
 LOCATION _____
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 SUBMITTAL PREPARED BY _____
 APPROVED BY _____
 DATE _____



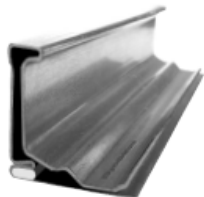
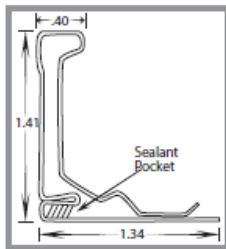
Submittal Form FLANGE

**SEALANT POCKET
FOR ALL FLANGE**
 Flame Spread - 5
 Smoke Density - 0
 Fuel Contribution - 0
 Life Expectancy - 20yr minimum

DOMJ Flange

- Designed to strengthen the duct wall and connect duct sections together.
- Furnished with an integrated sealant pocket for a secure air tight fit.
- Manufactured from 20-gauge steel in 10ft., 12ft. & 20ft. lengths.
- DOMJ is designed for large commercial and high-pressure applications.
- Bundles of 20ft. lengths available only with a Full Truckload order.
- Specialty metal available upon request.

J Flange

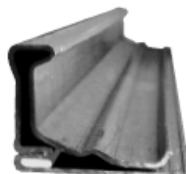
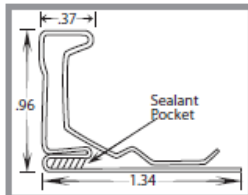


Item #	Code	Description
21230	DOMJ20	J Flange -20ft.
21236	DOMJ20SS	Stainless Steel J Flange -20ft.
21238	DOMJ20AL	Aluminum J Flange -20ft.
21234	DOMJ12	J Flange-12ft.
21233	DOMJ10	J Flange-10ft.

DOMH Flange

- Designed to strengthen the duct wall and connect duct sections together.
- Furnished with an integrated sealant pocket for a secure air tight fit.
- Manufactured from 22-gauge steel in both 12ft. & 20ft. lengths.
- DOMH is designed for low to medium pressure or residential applications.
- Bundles of 20ft. lengths available only with a Full Truckload order.
- Specialty metal available upon request.

H Flange



Item #	Code	Description
21231	DOMH20	H Flange-20ft.
21235	DOMH12	H Flange -12ft.

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Submittal Form VANE AND RAIL

DESCRIPTION

Hollow Turning Vane and Vane Rail are designed to redirect the air through elbows and tees in the ductwork without significant loss of air pressure. Assembled Vane & Rail minimizes turbulence in the ductwork.

FEATURES

- Hollow Turning Vane and Vane Rail are designed to redirect the air through elbows and tees in the ductwork without significant loss of air pressure. Assembled Vane & Rail minimizes turbulence in the ductwork.
- Duro Rail has self aligning tabs for easy vane installation.
- 2in. Turning Vane are manufactured from 26-gauge galvanized steel.
- 4in. Turning Vane are manufactured from 24-gauge galvanized steel.
- 2in. and 4in. Vane Rail are manufactured from 24 or 22-gauge galvanized steel.
- All Rail described on this page is a Duro Dyne version of Runner Type 1 as described in Smacna (see drawing below).

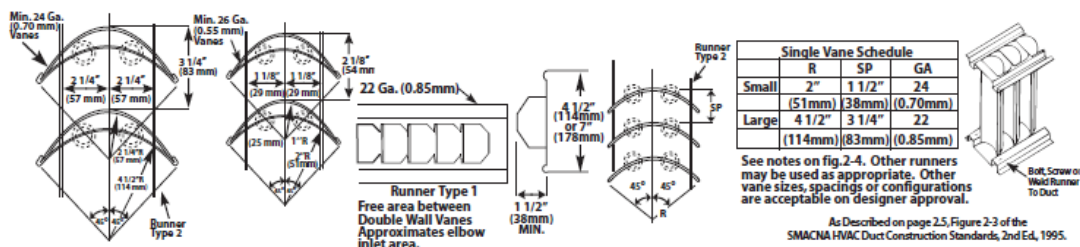


Hollow Turning Vane

Item #	Code	Description	Packaging	Weight (lbs.)	Master Skid Qty.
13203	HTV2-2610	26ga. 2in. Turning Vane 10ft.	5-10ft. pcs./Bundle	24	7200ft.
13220	HTV2-10AL	Alum. 2in. Turning Vane 10ft.	5-10ft. pcs./Bundle	13	7200ft.
13224	HTV2-10SS	Stainless 2in. Turning Vane 10ft.	5-10ft. pcs./Bundle	26	7200ft.
13207	HTV4-2410	24ga. 4in. Turning Vane 10ft.	5-10ft. pcs./Bundle	55	2500ft.
13222	HTV4-10AL	Alum. 4in. Turning Vane 10ft.	5-10ft. pcs./Bundle	33	2500ft.
13226	HTV4-10SS	Stainless 4in. Turning Vane 10ft.	5-10ft. pcs./Bundle	58	2500ft.

Vane Rail

Item #	Code	Description	Packaging	Weight (lbs.)	Master Skid Qty.
13300	DHVR2-	2in. Vane Rail 10ft.	10-10ft. pcs./Bundle	46	4000ft.
13221	HVR2-10AL	Alum. 2in. Vane Rail 10ft.	10-10ft. pcs./Bundle	18	6000ft.
13225	HVR2-10SS	Stainless 2in. Vane Rail 10ft.	10-10ft. pcs./Bundle	30	6000ft.
13302	DHVR4-	4in. Vane Rail 10ft.	10-10ft. pcs./Bundle	71	2000ft.
13223	HVR4-10AL	Alum. 4in. Vane Rail 10ft.	10-10ft. pcs./Bundle	36	2000ft.
13227	HVR4-10SS	Stainless 4in. Vane Rail 10ft.	10-10ft. pcs./Bundle	59	2000ft.



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GLASSTACK® 25

WATER BASED INSULATION ADHESIVE



FEATURES

- LEED EQ Credit 4.1
- High Strength
- Use with rotobonders
- Use with extruder coil lines, will not clog extruder heads
- Brush, roll, or spray
- Meets or exceeds all SMACNA requirements
- Excellent mold and mildew resistance

TECHNICAL SPECIFICATIONS

Packaging	(4) 1 gal./case, 5 gal. pails, 55/53 gal. drums
Shelf Life	18 months in unopened containers
Coverage Rate	Approximately 500 sq. feet depending on application technique.
Dry Time	Tack Time.....30 minutes Dry Time.....45 minutes to 1 hour Tack and dry times can vary depending on temperature, humidity and application method and thickness.
Solids Content	40% ± 2.5% by weight
Weight per gal.	9.8 lbs. ± 0.3 lbs.
Color	Gray (dries black), White (dries clear)
Temperature Limits	Storage and application... 35°F to 110°F Service..... -40°F to 200°F Protect From Freezing. If frozen, completely thaw prior to use. Passes 3 Freeze-Thaw Cycles.
Class 1 Smoke and Flame Rating LEED COMPLIANT SCAQMD Rule 1168	SURFACE BURNING CHARACTERISTICS Flame Spread10 Smoke Developed0 Tested in accordance with UL 723, and ASTM E-84. Satisfies the requirements of NFPA 90A, 90B, and 225.

RECOMMENDED USES

GLASSTACK 25 is a slower tacking water base insulation adhesive specially formulated for extrusion coil lines, rotobonders and spray applications where a fast dry time is not necessary when adhering fiberglass insulation to sheet metal ductwork.

APPLICATION INSTRUCTIONS

Prior to application clean the surface of all oils, dirt, and foreign matter for best results.

BRUSH/ROLLER:

Brush or roll adhesive to a desired thickness of 5 mils wet film thickness at a coverage rate of 90% minimum to achieve maximum performance.

SPRAY GUN:

Binks 2001 stainless steel gun, or equivalent, with a .066SS fluid nozzle and a .066SD air cap. Operate the above spray gun at approximately 15 psi fluid pressure and 40 psi atomizing pressure. Ideal coverage is 90% of the surface for maximum bond strength.

SPRAY COIL LINE:

Use approximately 20 psi fluid pressure, and 40 psi atomizing for a standard 5 foot coil line. If this does not provide adequate coverage, increase the fluid pressure until the desired 90% coverage is reached. Higher pressures may be needed for large machines.

EXTRUSION COIL LINES:

Using removable extrusion heads, set the fluid pressure to a setting that will provide a constant amount of adhesive to the sheet metal surface. Typical setting would be 30 psi fluid pressure. Higher pressures may be needed for increased number of extrusion heads.

CLEAN UP

Use soap and warm water.

Polymer Adhesives Sealant Systems Inc., is proud to be affiliated with the following organizations:



POLYMER ADHESIVES
SEALANT SYSTEMS, INC.

www.polymeradhesives.com



Air Handling Systems

Duct Liner PM *Fiber Glass Duct Liner*

Description

Duct Liner PM is a flexible duct liner insulation made from strong, glass fibers bonded with a thermosetting resin. The airstream surface is protected using a durable glass mat facing that contains an EPA-registered antimicrobial agent. The flexible glass mat also provides a smooth airstream surface.

Factory-Applied Edge Coating

Edge coating is factory applied to the edges of the liner core, ensuring coverage of the leading edges per NAIMA/SMACNA requirements. Shop fabrication cuts may be coated with SuperSeal® edge treatment (refer to publication AHS-202).

Uses

Duct Liner PM is specifically designed for lining sheet metal ducts in air conditioning, heating and ventilating systems, providing superior acoustical and thermal performance.

General Properties

Operating temperature (max.) – ASTM C411	250°F (121°C)
Air velocity (max.) – ASTM C1071	6,000 fpm (30.5 m/sec)
Fungi resistance – ASTM C1338	Does not breed or promote
Fungi resistance – ASTM G21	No growth
Bacteria resistance – ASTM G22	No growth

Standard Thicknesses and Packaging

Thickness	Roll Length		Roll Widths for All Thicknesses*	
	in	mm	lineal feet	lineal meters
½	13	100, 150, 200	31, 46, 61	34 to 36 864 to 914
1	25	50, 100, 150, 200	15, 31, 46, 61	44 to 48 1118 to 1219
1½	38	50, 100	15, 31	56 to 60 1422 to 1524
2	51	50	15	66 to 72 1676 to 1829

*Available in ¼" (6.4 mm) increments.

Contact your Regional Sales Office for stock items and availability of special sizes.

Surface Burning Characteristics

Duct Liner PM meets the Surface Burning Characteristics and Limited Combustibility of the following standards:

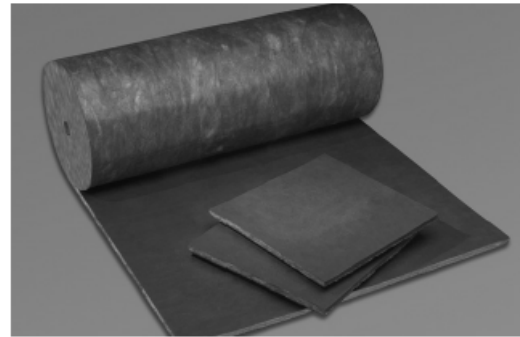
- Standard/Test Method
- ASTM E84
- UL 723
- NFPA 255
- NFPA 90A and 90B
- NFPA 259
- CAN/ULC S102-M88

Maximum Flame Spread Index	25
Maximum Smoke Developed Index	50

UL labels supplied on packages when requested on order.

Specification Compliance

- ASTM C1071, Type I
- ICC Compliant
- California Title 24
- ASHRAE 62
- MEA 353-93-M
- SMACNA Application Standards for Duct Liners
- NAIMA Fibrous Glass Duct Liner Installation Standard
- Canada: CGSB 51-GP-11M and CAN/CGSB 51.11



Advantages

Improves Indoor Building Environment. Duct Liner PM improves indoor environmental quality by helping to control both temperature and sound.

Will Not Support Microbial Growth. The airstream surface of Duct Liner PM is treated with an antimicrobial agent specifically registered with the EPA for HVAC applications to resist potential growth of fungus or bacteria on the airstream surface.

Duct Liner PM duct liner meets all requirements for fungi and bacterial resistance. Tests were conducted in accordance with ASTM C1338 and ASTM G21 (fungi testing) and ASTM G22 (bacteria resistance testing). Detailed information is available in Johns Manville fact sheet HSE-103FS.

Note: As with any type of surface, microbial growth may occur in accumulated duct system dirt, given certain conditions. This risk is minimized with proper design, filtration, maintenance and operation of the HVAC system.

Cleanability. If HVAC system cleaning is required, the airstream surface may be cleaned with industry-recognized dry methods. See the North American Insulation Manufacturers Association (NAIMA) "Cleaning Fibrous Glass Insulated Air Duct Systems."

Green Building Attributes

GREENGUARD® certification is not intended for residential environments. Instead, the certification is intended only for buildings meeting ASHRAE 62.1-2007 commercial building ventilation rates. This certification is proof that the product meets the GREENGUARD Environmental Institute's indoor air quality standards and product emission standards for VOCs.





Duct Liner PM

Fiber Glass Duct Liner

Installation

Duct Liner PM installation must be performed in accordance with the requirements of the NAIMA Fibrous Glass Duct Liner Standards or SMACNA HVAC Duct Construction Standard. All transverse edges, or any edges exposed to airflow, must be coated with an approved duct liner coating material, such as Johns Manville SuperSeal products.

Minimizes Pre-installation Damage. Duct Liner PM's durable glass mat facing is resistant to damage that can occur during in-shop handling, fabrication, jobsite shipping and installation.

Easy to Fabricate. Duct Liner PM is lightweight and easy to handle. Clean, even edges can be accurately cut with regular shop tools.

Thermal Performance

Thickness in mm	R-value		Conductance	
	(hr•ft ² •°F)/Btu	m ² •°C/W	Btu/(hr•ft ² •°F)	W/m ² •°C
½ 13	2.2	0.39	0.46	2.61
1 25	4.2	0.74	0.24	1.36
1½ 38	6.3	1.11	0.16	0.91
2 51	8.0	1.41	0.13	0.74

R-value and conductance are calculated from the material thermal conductivity tested in accordance with ASTM C518 at 75°F (24°C) mean temperature.

Sound Absorption Coefficients (Type "A" Mounting)

Thickness in mm	Sound Absorption Coefficient at Frequency (Cycles per Second) of						
	125	250	500	1000	2000	4000	NRC
½ 13	0.08	0.17	0.42	0.63	0.77	0.89	0.50
1 25	0.14	0.28	0.64	0.85	0.97	1.09	0.70
1½ 38	0.24	0.51	0.90	0.99	1.01	1.10	0.85
2 51	0.26	0.69	1.02	1.08	1.03	1.10	0.95

Coefficients were tested in accordance with ASTM C423 and ASTM E795.

ISO 9000 Certification

Johns Manville mechanical insulation products are designed, manufactured and tested in our own facilities, which are certified and registered to stringent ISO 9000 (ANSI/ASQC 90) series quality standards. This certification, along with regular, independent third-party auditing for compliance, is your assurance that Johns Manville products deliver consistent high quality.



717 17th St.
Denver, CO 80202
1-800-654-3103
specJM.com

AHS-424 10/13 (Replaces 2/05)

North American Sales Offices, Insulation Systems

Eastern Region
P.O. Box 158
Defiance, OH 43512
(800) 334-2399
Fax: (419) 784-7866

Western Region and Canada
P.O. Box 5108
Denver, CO 80217
(800) 368-4431
Fax: (303) 978-4661

The physical and chemical properties of Duct Liner PM listed herein represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Numerical flame spread and smoke developed ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions. Check with the Regional Sales Office nearest you to assure current information.

All Johns Manville products are sold subject to Johns Manville's standard Terms and Conditions, including Limited Warranty and Limitation of Remedy. For a copy of the Johns Manville standard Terms and Conditions, Limited Warranty and Limitation of Remedy, and information on other Johns Manville thermal insulation and systems, call (800) 654-3103.

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SUBMITTAL RECORD _____
 JOB _____
 LOCATION _____
 SUBMITTED TO _____
 SUBMITTAL PREPARED BY _____
 APPROVED BY _____
 DATE _____



Submittal Form DDP - Diamond Point Insulation Fastener

DESCRIPTION: When liner is placed inside air conditioning or heating duct work, the movement of air could cause the insulation to delaminate. To prevent this, SMACNA Specifications call for the use of fasteners in addition to adhesive to secure the liner. The fasteners may be of three types:

- A. **ADHESIVE:** This fastener is bonded to the ductwork with an appropriate adhesive and allowed to set up. After sufficient drying time the liner is impaled on the pin and a washer added to retain the liner.
- B. **MECHANICAL:** This type of fastener mechanically attaches itself to the duct work. The most popular style is a hardened nail with an attached washer. This fastener is impact driven through the liner and forms a positive mechanical grip with the metal.
- C. **WELD:** This fastener forms a permanent bond to the duct work by becoming part of it as in any weld. Two styles are currently in use. The first fastener is a mechanical fastener which is driven through the liner and welded to the duct work underneath. The second fastener is a pin which is welded to the duct work prior to the insulation. The liner is then impaled (much like the adhesive fastener) over the pin and secured by a washer.

SPECIFICATIONS

Insulation Fasteners are designed to meet SMACNA HVAC Duct Construction Standard for Mechanical Fasteners.
 All steel used meets ASTM-A591.
 All dimensions used in pin length are from bottom of head or base of fastener.
ALL PINS AND WASHERS ARE ZINC PLATED CRS UNLESS OTHERWISE STATED.



Diamond Point Pins

Pin: .130" Diameter
 Washer: Diameter - 1.0"
 Thickness: -.015" - .017"

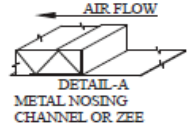
Item#	Code	Nominal Length After Setting	Use
■ 26200	DDP12	.365	1/2" insulation
■ 26201	DDP34	.531	1" 1-2# density
■ 26202	DDP100	.781	1" 2-3# density
■ 26203	DDP118	1.000	1" 3# density
■ 26204	DDP150	1.365	1 1/2" insulation
■ 26205	DDP200	1.781	2" insulation

SUGGESTED SPECIFICATIONS

All duct liner shall be secured to the duct work in accordance with SMACNA HVAC Duct Construction Standards. Fasteners shall be Mechanical type Fastener Code DDP as manufactured by Duro Dyne Corporation, Bay Shore, N.Y.

- DUCT LINER INSTALLATION -

METAL NOSING MUST BE USED WHEREVER LINER IS PRECEDED BY UNLINED METAL; OTHERWISE WHEN VELOCITY EXCEEDS 4000 FPM (20.3 MPS) USE METAL NOSING ON EVERY LEADING EDGE. NOSING MAY BE FORMED ON DUCT OR BE CHANNEL OR ZEE ATTACHED BY SCREWS, RIVETS OR WELDS.

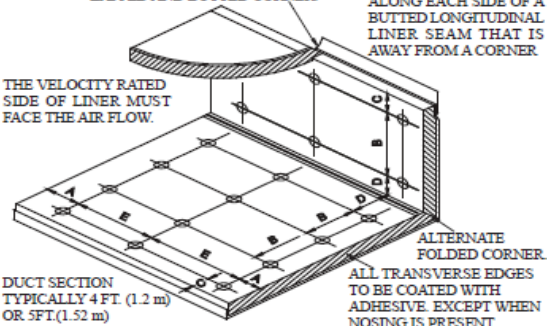


INTERIOR WIDTH OF 8"(200 mm) AND LESS DOES NOT REQUIRE PINS

LAPPED AND BUTTED CORNER.

PLACE PINS 3" (76 mm) ALONG EACH SIDE OF A BUTTED LONGITUDINAL LINER SEAM THAT IS AWAY FROM A CORNER.

THE VELOCITY RATED SIDE OF LINER MUST FACE THE AIR FLOW.



DUCT SECTION TYPICALLY 4 FT. (1.2 m) OR 5 FT. (1.52 m)

MAXIMUM SPACING FOR FASTENERS. ACTUAL INTERVALS ARE APPROXIMATE

"A" PIN ROW MAY BE OMITTED WHEN METAL NOSING IS USED. "E" THEN STARTS FROM THE NOSING.

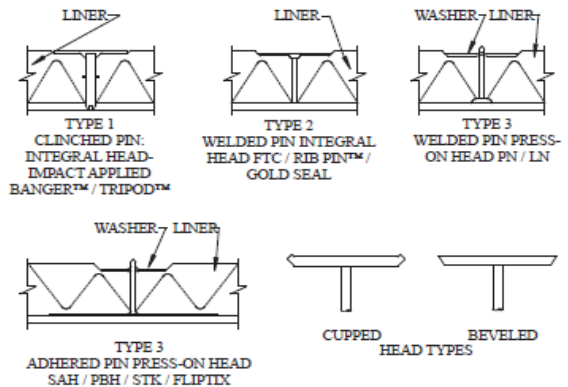
ALL TRANSVERSE EDGES TO BE COATED WITH ADHESIVE, EXCEPT WHEN NOSING IS PRESENT.

LINER ADHERED TO THE DUCT WITH 90% MIN. AREA COVERAGE OF ADHESIVE

Velocity*	Dimensions				
	A	B	C	D	E
0-2500 FPM (0-12.7 MPS)	3" (76.2)	12" (305)	4" (102)	6" (152)	18" (457)
2501-6000 FPM (12.7-30.5 MPS)	3" (76.2)	6" (152)	4" (102)	6" (152)	16" (406)

*UNLESS A LOWER LEVEL IS SET BY MANUFACTURER OR LISTING AGENCY

- LINER FASTENERS -



INSTALLED PINS AND WASHERS SHALL NOT COMPRESS LINER MORE THAN THE CORRECT LENGTH SPECIFIED FOR THE LINER THICKNESS USED.

Duro Dyne East Division, Bay Shore, NY
 Duro Dyne Midwest Division, Fairfield, OH
 Duro Dyne West Division, Fontana, CA

631-249-9000 Fax: 631-249-8346
 513-870-6000 Fax: 513-870-6005
 562-926-1774 Fax: 562-926-5778



**DURO
DYNE**

DYN-O-MATE



Quad Cleat Plus

The Heavy Duty Quad Cleat Plus is designed specifically for high pressure, heavy duty transverse duct.

Quad Cleat

Creating a secure seal between sections of ductwork is important to minimizing system leakage. Sections of duct utilizing four bolt flange systems must sit securely against the gasket installed between mating ductwork. While corners of duct are bolted together, the flange between the bolts utilize cleats to apply pressure to the flanges, encapsulated gasket and eliminate deflection.

Both Quad Cleats incorporate embossed "darts" which help the cleat lock firmly onto the flange. It is a universal fastener for use with most commercial size flanges. If you use more than one brand of flange, this eliminates the need to stock more than one cleat.

FEATURES

- Both are compatible with Dyn-O-Mate® J, Ductmate™ 35, CL Ward™ J, Ward Industries™ J, Hardcast™ flanges, TDC, TDF and TDX Connections
- Manufactured from 22 gauge galvanized steel
- Quad Cleat Plus is also available in stainless steel
- Other gauges and materials available upon request.

**DURO
DYNE**

DYN-O-MATE Cleat

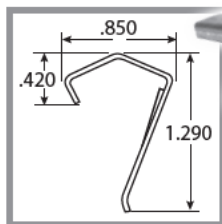
- DOM-CLT and DOM-PCLT for use with DOMJ & DOMH 20 gauge flanges for airtight duct connections.
- DOM-CLT is manufactured from 20 gauge galvanized steel 6" pieces.
- DOM-PCLT is extruded .070" PVC and designed for break away connection needs.



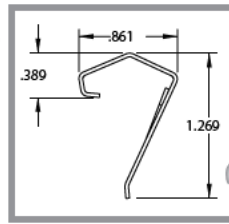
Item #	Code	Description
21250	DOMCLT	6in. Metal Cleat
21256	DOMCLTSS	6in. Stainless Steel Cleat
21252	DOMPCLT	6in. Plastic Cleat

Quad Cleat

- DOM-QCLT & HDQC-PLUS are compatible with Dyn-O-Mate® J, Ductmate™ 35, CL Ward™ J, Ward Industries™ J, Hardcast™ flanges, TDC, TDF and TDX Connections, and is manufactured from 22 gauge steel.
- HDQC-PLUS is also available in stainless steel.
- HDQC-PLUS is recommended for high pressure, heavy duty transverse duct.

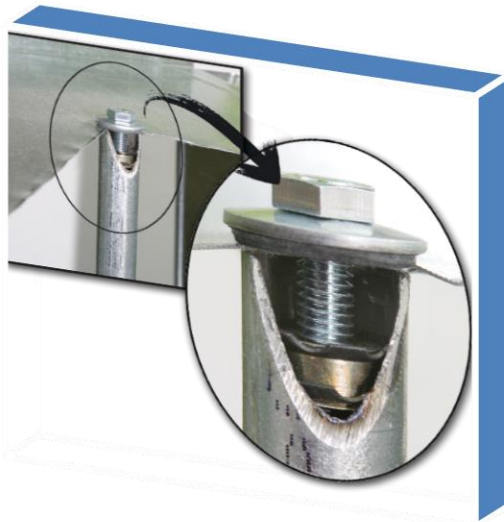


DOMQCLT



HDQC-PLUS

Item #	Code	Description
21259	DOMQCLT	Metal Quad Cleat
21269	HDQC-PLUS	Heavy Duty Quad Cleat Plus
21228	HDQC-PLUS-SS	Heavy Duty Quad Cleat Plus - Stainless



DYN-O-LOC®

DESCRIPTION:

Tie rods can be used to support duct sizes over 48". Dyn-O-Locs insert into the ends of the hollow tie rods to provide a means of attaching the rods to the duct.

- Dyn-O-Locs are available for use with 1/2" or 3/4" Conduit.
- Installed lock is pull tested to withstand over 1900 lbs.
- Large self-sealing washer preinstalled on the Bolt.
- Long bolt for easier installation.
- Bolt length: 1-1/2" total or 1-3/8" under the head



- Locks conveniently packed in separate poly bag.
- Bolts (with washer attached) packed underneath locks.

Item #	Code	Description
21097	DOMRL12	1/2" Dyn-O-Loc - 250/box
21098	DOMRL34	3/4" Dyn-O-Loc- 250/box
21208	DOMRL12-100	1/2" Dyn-O-Loc - 100/box
21209	DOMRL34-100	3/4" Dyn-O-Loc- 100/box
21076	RLT	Dyn-O-Loc Tool
ALSO AVAILABLE SEPERATELY:		
21008	SN12-250	1/2in Dyn-O-Loc Spring Nut Only
21009	SN34-250	3/4in Dyn-O-Loc Spring Nut Only
21286	SWW1420-250	1/4-20 Dyn-O-Loc Bolt with Washer

DYN-O-LOC® TOOL

The Dyn-O-Loc Tool aids installation and assures accurate spacing.

Please reference SMACNA Duct Construction Standards Section 2.5 Third Edition 2005.