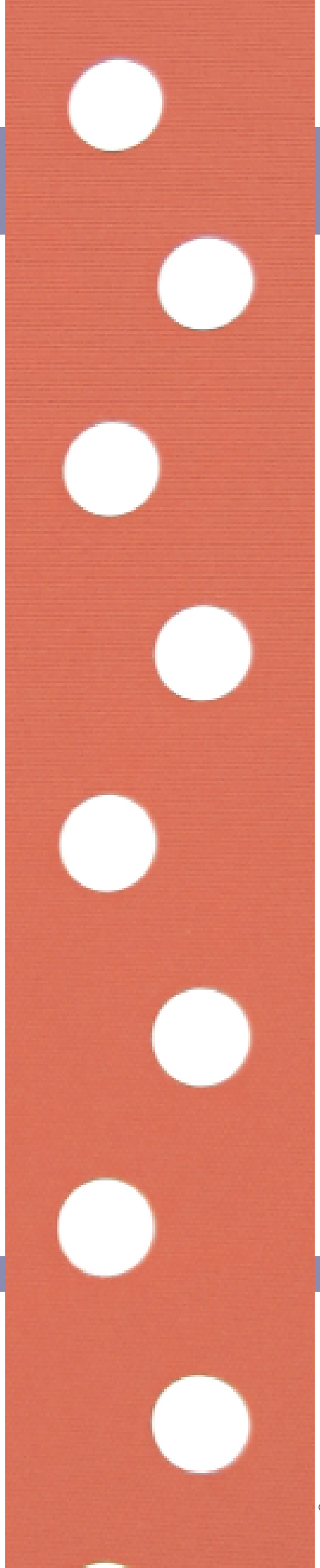


ENGINEERING & DESIGN MANUAL

This manual includes all design and general product information required to design a complete DuctSox fabric duct ventilation system.

Series/Shape

Cylindrical
Surface Mount

Model

Comfort-Flow™
High-Throw™
Low-Throw™

Fabrics

Coronado™
Sedona-Xm™
Verona™
TufTex™
DuraTex™
EkoTex™
Stat-X™
Microbe-X®

Suspension

Tension Cable
Suspended H-Track
Flush Mount Track

DUCTSOX®
Fabric Air Dispersion Products

TABLE OF CONTENTS

INTRODUCTION / DESIGN STEPS

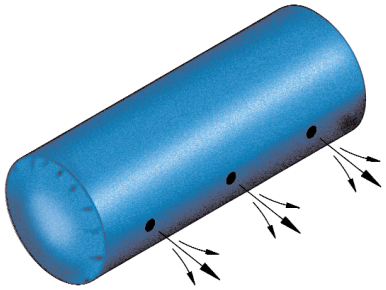
This design manual should assist through the design process for all DuctSox® Fabric Duct Ventilation Systems. The process involves considerations that include layout, sizing, air dispersion, appearance, durability and installation.

The five steps of DuctSox system design:

1. **Series / Shape** select shape for the application - Cylindrical or Surface Mount.
2. **Design Layout** determine duct layout and sizing - selecting DuctSox location, diameter, lengths and required fittings.
3. **Fabric** select fabric based on product quality, porosity, colors and/or required air dispersion type.
4. **Air Dispersion** determine type, location and size of vents for Comfort Flow, orifices for High Throw or calculate required porosity for Low-Throw Series using to supplied airflow and static pressure.
5. **Suspension** select Tension Cable, Suspended H-Track, Flush Mount Track or 3 X 1 for suspension.

Selecting the Series - or shape of the DuctSox system is based on the details of the application. Cylindrical systems are common for open ceiling spaces. Surface Mount Series require a flat surface to connect to (ceiling or wall) for proper installation.

Cylindrical Series



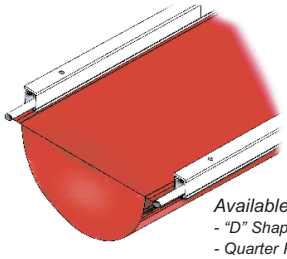
CYLINDRICAL SERIES

Commonly mounted horizontally using a tension cable or suspended aluminum track suspension system - this tubular shape is our most popular.

The Cylindrical Series is available with all fabric choices, all airflow models and standard diameters ranging from 6”-72”. Inlet diameter is based on inlet velocity requirements based on system design and accoustic requirements. Different than conventional metal, constant diameters are preferred to minimize frictional loss (fewer fittings required) and ease of installation.

This option also includes a wide variety of elbows, take-off’s, transitions in standard - plus custom fitting configurations. This series can also be installed vertically for a section - or the entire length with proper precaution for suspension attachment for support as the system deflates.

Surface Mount



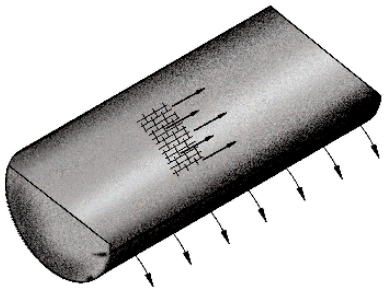
Available in:
- “D” Shape
- Quarter Round

SURFACE MOUNT SERIES

Available in a “D-Shape” or a “Quarter-Round”, Surface Mount Series are commonly installed against a wall or ceiling. Airflow enters the system either through the end or through the flat panel against the ceiling or wall.

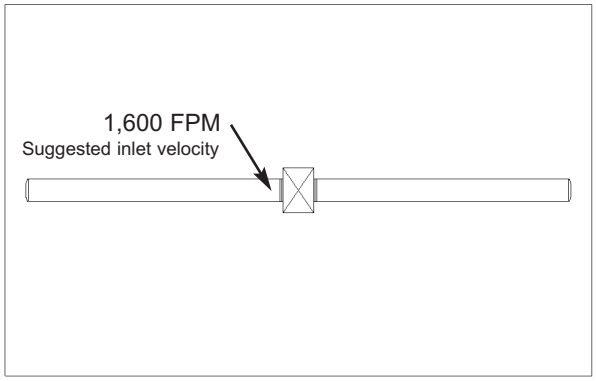
In design, special sizing considerations include diameter selection of the system as well as the type, size, location and quantity of inlets. The Surface Mount Series offers similar flexible design features as our Standard Series including air dispersion methods, zippered fittings and connections - however is not available in our PolyTex fabric option.

Standard diameters range from 14”-34” and air inlets can be configured from the ceiling, wall or ends. Multiple inlets may allow for smaller overall size.

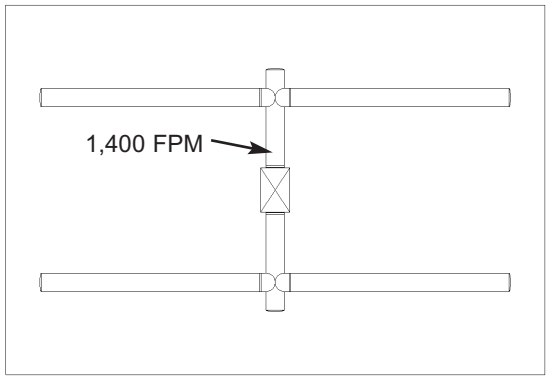


2 DESIGN LAYOUT

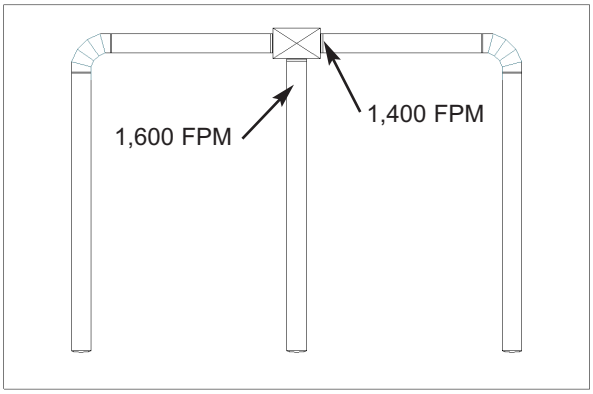
Simply stated, a DuctSox® system performs as both a duct and a diffuser. The system layout should target the general air dispersion required - whether even dispersion or directed delivery. With the unlimited custom design capabilities - there could be several solutions to any given application. With that in mind - simple straight runs reduce equipment and installation time.



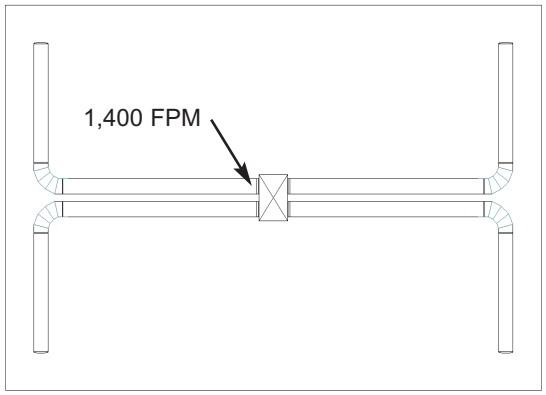
Simple and Economical



Even Distribution



Even dispersion - side AHU location



Targeted Airflow to ends (windows).

NOTES:
Because air outlets can be integrated into all sections, system design may vary significantly while still providing excellent air dispersion. Size and orientation of air outlets may allow for a simple and less costly layout than conventional design.

There is little need to reduce diameter to reduce cost or increase flow rates along straight lengths as the system works off the basic extended plenum principle. When restriction in the DuctSox System is needed for proper air distribution, an AFD (Adjustable Flow Device) should be included (std. on designer & premium fabric options).

Systems that include custom fittings require a approval drawing signed by contractor prior to production.

CYLINDRICAL SERIES

Diameter based on airflow and inlet conditions. Lower inlet velocities (1,000-1,200 FPM) reduce stress, noise and yield a better balanced system.

1,600 FPM Maximum: Straight Run
1,400 FPM Maximum: Inlet with Fittings

If the required diameter is too large for the space - consider breaking the system down into multiple runs.

Diameter	Inlet Velocity			
	1,000	1,200	1,400	1,600
8	349	419	489	559
10	545	654	764	873
12	785	942	1,100	1,257
14	1,069	1,283	1,497	1,710
16	1,396	1,676	1,955	2,234
18	1,767	2,121	2,474	2,827
20	2,182	2,618	3,054	3,491
22	2,640	3,168	3,696	4,224
24	3,142	3,770	4,398	5,027
26	3,687	4,424	5,162	5,899
28	4,276	5,131	5,986	6,842
30	4,909	5,890	6,872	7,854
32	5,585	6,702	7,819	8,936
34	6,305	7,566	8,827	10,088
36	7,069	8,482	9,896	11,310
38	7,876	9,451	11,026	12,601
40	8,727	10,472	12,217	13,963
42	9,621	11,545	13,470	15,394
44	10,559	12,671	14,783	16,895
46	11,541	13,849	16,157	18,466
48	12,566	15,080	17,593	20,106
50	13,635	16,362	19,090	21,817
52	14,748	17,698	20,647	23,597
54	15,904	19,085	22,266	25,447
56	17,104	20,525	23,946	27,367
58	18,348	22,017	25,687	29,356
60	19,635	23,562	27,489	31,416
62	20,966	25,159	29,352	33,545
64	22,340	26,808	31,276	35,744
66	23,758	28,510	33,262	38,013
68	25,220	30,264	35,308	40,352
70	26,725	32,070	37,415	42,761
72	28,274	33,929	39,584	45,239

Inlet velocities greater than 1,600 FPM is not covered by warranty program.

"D-SHAPE" SERIES

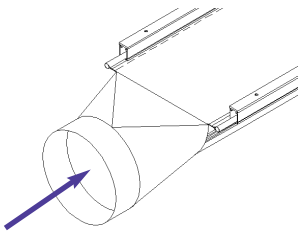
Choosing the D-Shape diameters are slightly different that standard DuctSox®.

1 - Select Inlet Configuration: End or Top

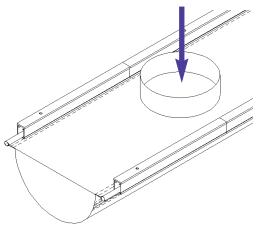
2 - Determine the airflow through each inlet. For multiple Top inlets, calculate airflow per inlet.

3 - Select inlet Diameter.

4 - Select D-Shape Diameter (per inlet diameter & type)



End-Inlet: 1,000-1,600FPM



Top-Inlet: 1,000-1,200FPM

Inlet Collar Dia. (inches)

Diameter	Inlet Velocity			
	1,000	1,200	1,400	1,600
6	196	236	275	314
8	349	419	489	559
10	545	654	764	873
12	785	942	1,100	1,257
14	1,069	1,283	1,497	1,710
16	1,396	1,676	1,955	2,234
18	1,767	2,121	2,474	2,827
20	2,182	2,618	3,054	3,491
22	2,640	3,168	3,696	4,224
24	3,142	3,770	4,398	5,027

Air volume per inlet diameter with set inlet velocity (CFM)

Top Inlet: Select minimum D-Shape Dia. from table below per selected inlet diameter.

End Inlet: Select maximum D-Shape Dia. from table below per selected inlet diameter.

D-Shape Dia.	End Inlet Min. Dia.	Top Inlet Max. Dia.
14	10	10
18	13	14
22	16	18
26	18	22
30	21	26
34	24	30

To ensure optimum design, contact factory for design support on all Surface Mount Series Systems.

2 DESIGN LAYOUT - FITTINGS & ZIPPERS

To allow for variability in system layout, we offer many common fittings in fabric with simple zipper connections.

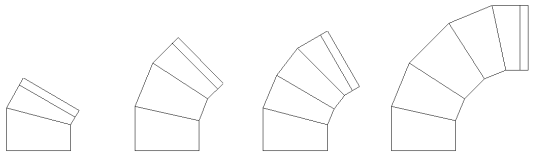
ZIPPERS

Straight lengths and/or fitings are connected together using a radial zipper. The zipper is affixed with the start/stop located at the bottom center - and each includes a 2” fabric overlap to conceal the zipper.

The following table indicates maximum sectional length of a straight run. Longer sections are broken into equal lengths: 60 ft of 36” Dia would be constructed of two 30 foot long sections.

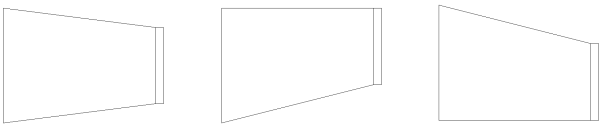
Cylindrical		D-Shape	
Diameter	Max Length	Dia.	Max.
6”	15’	14”	25’
8-10”	20’	18”	25’
12”-16”	25’	22”	30’
18”-20”	30’	26”	35’
22”-26”	35’	30”	35’
28”-40”	**40’**	**34”**	**40’**
42”-44”	35’		
46”-50”	30’		
52”-56”	25’		
58”-60”	20’		
62”+	15’		

Economy (PolyTex) max sectional length: 50 ft (all dia)



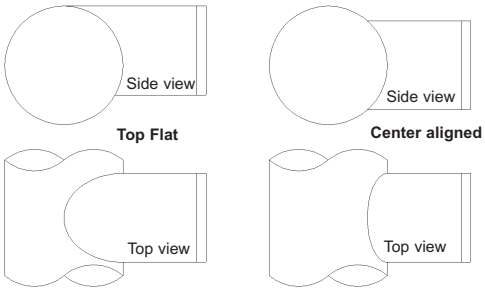
RADIUS ELBOWS

The standard centerline radius of an elbow is 1.5 x dia. Number of gores and sizes depend on angle of turn. Custom elbows are available upon request. Zippers can also be rotated for offsets / elevation changes on more complicated systems.



TRANSITIONS

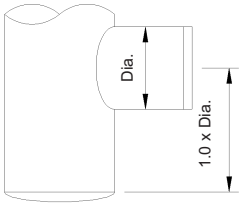
Simple reducing transitions are available in Concentric, Top Flat or Bottom Flat configurations. Each transition fitting includes two zippers and vary in length from 24”-48” (based on diameter change).



TAKE-OFF (T’s)

When designing complicated systems, efficiency take-off fittings direct air to areas perpendicular to the main run. Shown above in Top Flat and Concentric options (Bottom Flat available). The branch duct will require a zipper for attachment.

For better airflow management, branch ducts should be positioned at least 1.5 times the outlet diameter from endcaps.

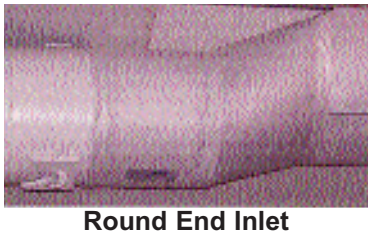


SURFACE MOUNT FITTINGS

Common and custom fittings are available for Surface Mount Series.

Elbow

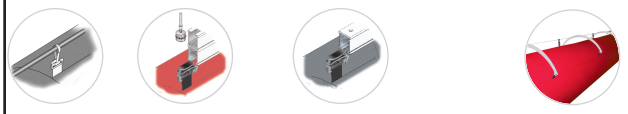
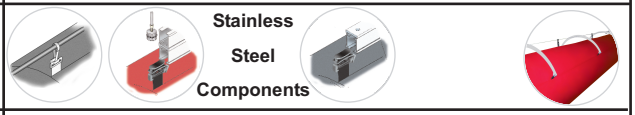
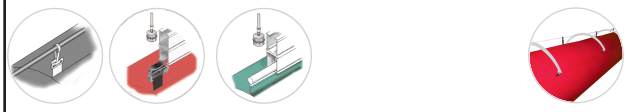
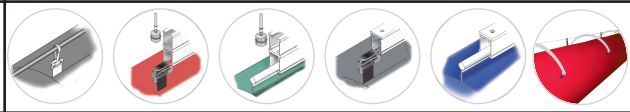
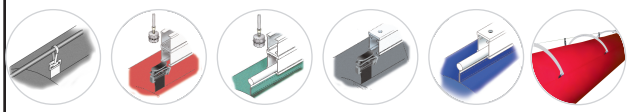
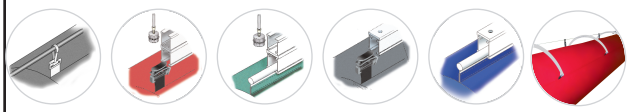
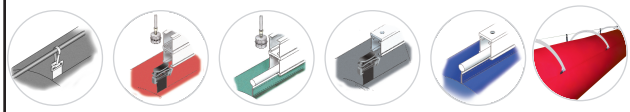
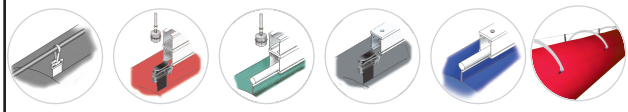
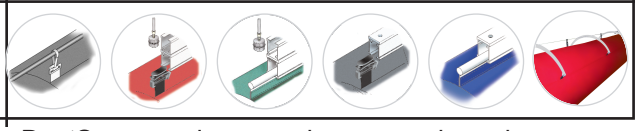
Take-Off



Round End Inlet

DESIGN RECOMMENDATIONS

Design Steps 3 4 5

Application	Fabric Options	Model/Airflow*	Suspension & Attachment Options
Food Processing	Microbe-X Sedona-Xm or Verona	LT or CF CF	
Industrial, Manufacturing, Warehousing & Distribution	Verona Sedona-Xm,TufTex or DuraTex EkoTex (36" dia. max)	CF CF or HT HT	
Pools	Coronado Sedona-Xm or Verona	CF	
Gymnasium	Coronado, Verona TufTex or DuraTex Sedona-Xm	CF CF or HT	
Office	Coronado Sedona-Xm or Verona TufTex or DuraTex	CF CF or HT	
Retail Grocery Store	Sedona-Xm or Verona TufTex or DuraTex	CF CF or HT	
Restaurant, Bar, Cafeteria	Coronado Sedona-Xm or Verona TufTex or DuraTex	CF CF or HT	
Library, School Classroom	Sedona-Xm or Verona TufTex or DuraTex	CF CF or HT	
Telecom	Stat-X	CF	
Auditorium, Sport Arena, Convention Center, Church	Verona TufTex or DuraTex Sedona-Xm	CF CF or HT	
Temporary Structure, Animal Housing,Tent	Verona DuraTex EkoTex(36" dia. max)	CF CF or HT HT	
Clean Room, Test Lab	Stat-X or Verona Sedona-Xm Microbe-X	CF CF or LT* CF or LT	

Fabric, Model and Suspension recommendations are based on DuctSox experience and may vary based on economy, aesthetics or any other conditions per project. (*Sedona-Xm available in custom porosities with surcharge)

* **Model / Airflow:**
CF = Comfort-Flow Model / L-Vent, S-Vent, or Mesh Vents
HT = High-Throw Model / Engineered Orifices or SG (diffusers (in Sedona-Xm only)
LT = Low-Throw Model / Porous Fabric

3 DESIGN - FABRIC SELECTION

STEP 1 - SELECT FABRIC FUNCTION - POROSITY

Air Porous Fabric

Air passes through the fabric weave, fabric porosity varies per fabic choice. This option is most commonly an alternate to exposed double wall duct.

Benefits	Limitations
No Condensation	Long lengths may disperse too much airflow through fabric
Reduced Dust on Top	
No Heat Gain/Loss	
LT & CF Airflow	No HT Airflow for Verona
HT in Sedona-Xm, Coronado	

Note: Dirt from poorly filtered supply air may migrate through weave of air porous fabrics - eventually discoloring light color fabrics. Filtration efficiency of 50% or greater plus a regular maintenance plan will reduce effects.

Non-Porous Fabric

No air passes through the fabric weave. This option is most commonly an alternate to exposed single wall duct / diffusers.

Benefits	Limitations
HT & CF Airflow	No LT Airflow
	Limited Color Options
	Dust On Top

Note: Dirt does not pass through or stain non-porous fabric.

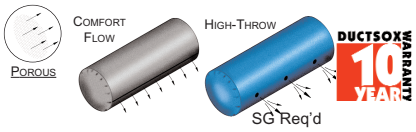
STEP 2 - SELECT FABRIC

Coronado Fabric is similar to Premium Sedona-Xm listed below.

Coronado

6.75 oz/yd² Antimicrobial Treated Woven Polyester
UL Classified (NFPA 90-A & ICC-AC167)

(Camo, Cork, Harvest, Galvanized)



PREMIUM

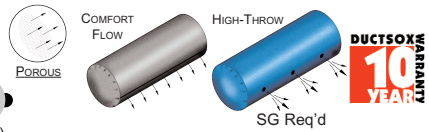
Combination of quality fabrics with durable and aesthetic construction.

- Inlet Cover Sleeve
- Zippered Inlet Connection
- Interior Seams / Construction
- Zippered Endcap
- 10 Year Warranty
- Standard AFD's
- Launder-able

Sedona-Xm

6.75 oz/yd² Antimicrobial Treated Woven Polyester
UL Classified (NFPA 90-A & ICC-AC167)

(Black, Gray, White, Beige, Green, Blue, Red, Custom Colors)

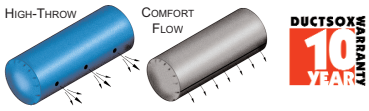


TufTex

8.2 oz/yd² Coated Polyester, UL Classified (NFPA 90-A)

(Black, Silver, White, Green, Blue, Red, Taupe)

NON POROUS



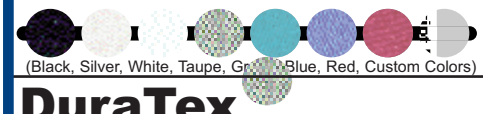
COMMERCIAL

Durable construction and fabrics with quality features:

- Zippered Inlet Connection
- Interior Seams - Verona
- Exterior Seams - DuraTex
- 5 Year Warranty
- Launder-able

Verona

5.3 oz/yd² Woven Polyester, UL Classified (NFPA 90-A)



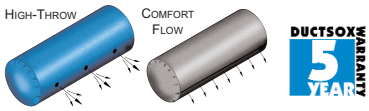
(Black, Silver, White, Taupe, Green, Blue, Red, Custom Colors)

DuraTex

5.5 oz/yd² Coated Polyester, UL Classified (NFPA 90-A)

(Black, Taupe, White, Blue, Silver)

NON POROUS



ECONOMY

Economy Class offers solutions for budget concious projects.

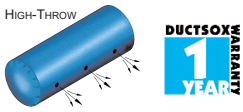
- Simple Inlet Connection
- Exterior Seams
- 1 Year Warranty

EkoTex

5.4 oz/yd² Woven Polyester Coated, UL Classified (NFPA 90-A)

(Silver)

NON POROUS



SPECIALTY

Unique fabrics developed for performance in specific applications.

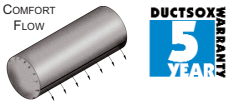
- Zippered Inlet Connection
- Interior Seams
- 5 Year Warranty - Stat-X
- 1 Year Warranty - Microbe-X
- Launder-able

Stat-X

2.9 oz/yd² Anti-Static Polyester, UL Classified (NFPA 90-A)

(Light Blue, White)

POROUS



Microbe-X

3.2 oz/yd² Antimicrobial Woven Polyester, USDA Approved

(White)

POROUS

PRESSURE REVIEW

Air is dispersed through a DuctSox system as a result of a positive pressure. Assuming a closed system, design selections are based on Average Pressure (AP), calculated using:

$$AP = ISP_1 + 0.66x(VP-FL) \quad \text{(inch } H_2O\text{)}$$

ISP_1 = Inlet Static Pressure
VP = Velocity Pressure = $(Velocity/4005)^2$
FL = Frictional Pressure Loss

Inlet Static Pressure (ISP) indicates static pressure supplied at the inlet location.

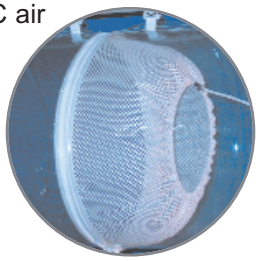
Standard	½"	*w.g.*
Range	1/8" - 3"	*w.g.*

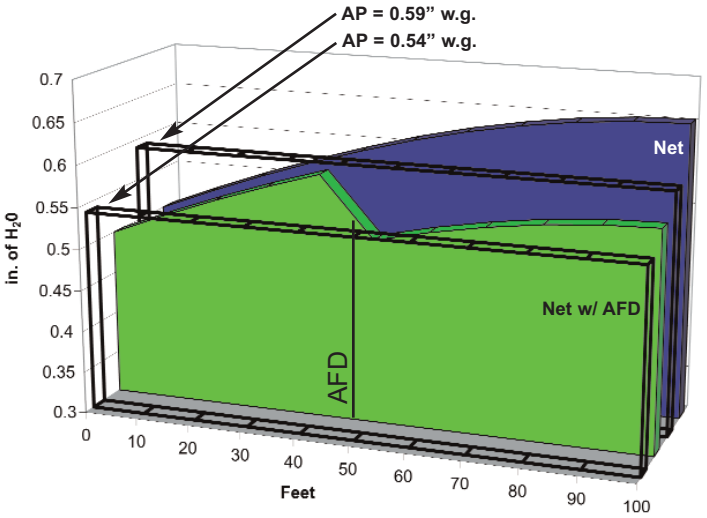
Velocity Pressure (VP) is regained within the closed system as static pressure. To ensure proper inflation, ISP must be 30% higher than the VP.

Frictional Loss (FL) is low due to designs with constant diameter and even dispersion (reducing airstream velocity).

ADJUSTABLE FLOW DEVICE

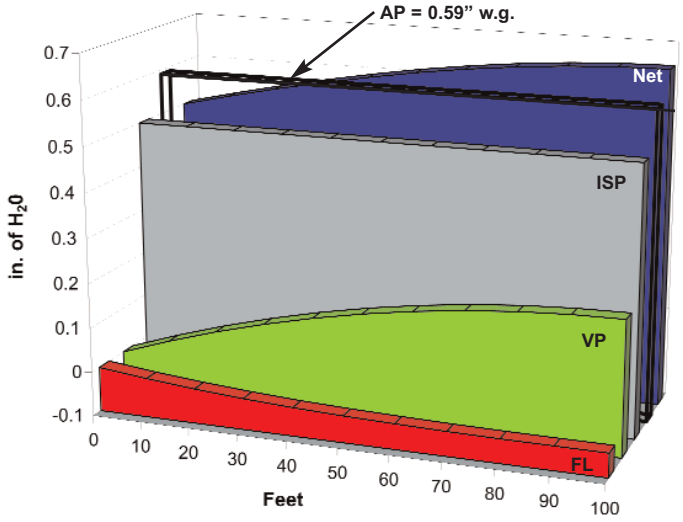
Airflow control is a critical in HVAC air dispersion. The zip-in Adjustable Flow Device (AFD) offers variable resistance to balance static regain, balance airflow to branches, reduce turbulence and reduce abrupt start ups. Standard for all Sedona-Xm and TufTex systems.





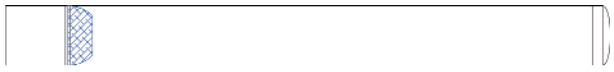
PRESSURE MODEL

A comprehensive pressure model reveals net pressures within a single DuctSox length. Average pressure, as shown, is the best model to calculate outlets.



AFD LOCATIONS

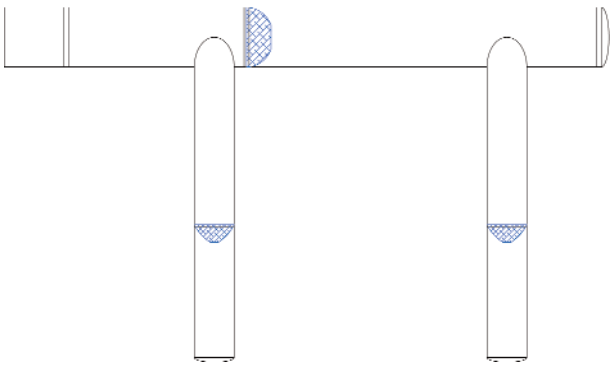
INLET
- Balance multiple runs
- Reduce/eliminate airflow turbulence



MIDDLE
- Balance static regain

NO-POP
- Reduce inflation pop

PLENUM AND BRANCHES
- Direct airflow into branches and balance static regain



4 AIRFLOW: FABRIC AIRFLOW, TYPE AND DIRECTION

FABRIC AIRFLOW

If the design includes a porous fabric - this airflow can be calculated using the following equations:

$$Q_{fabric} = FP \times SA \times (AP/0.5) \quad \text{(CFM)}$$

FP = Fabric Porosity (rated) (CFM/ft²)
SA = Surface Area (all fabric) (ft²)
AP = Average Pressure (inch/w.g.)

Fabric	Porosity (FP) (CFM/ft² @ .5" w.g.)
Coronado	1.5
Sedona-Xm	1.5
Verona	1.5
Stat-X	2
Microbe-X	6, 13, 20 & 29
TufTex	0
DuraTex	0
PolyTex	0

Porous fabrics are used for Comfort Flow and Low-Throw Series only.

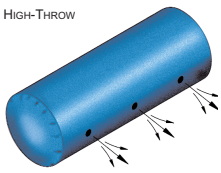
AIRFLOW MODELS

Low Throw Series (LT)

Calculate requied fabric porosity (FP) to evenly disperse airflow.

$$FP = \left(\frac{Q_{total}}{SA \times (AP/0.5)} \right) \quad \text{(CFM/ft²)}$$

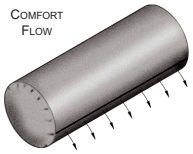
Available for design with Microbe-X fabric only.



High Throw Series (HT)

1. Determine required throw
2. Select orifice size & orientation
3. Calculate quantity of orifices

HT available on Sedona-Xm, TufTex, DuraTex & PolyTex fabrics only.



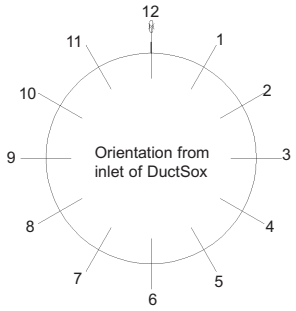
Comfort Flow Series (CF)

1. Calculate airflow through fabric
2. Calculate Vent Size
3. Identify Vent Orientation

CF available on Sedona-Xm, TufTex, Verona, DuraTex, Stat-X & Microbe-X fabrics.

THROW - DIRECTIONAL AIRFLOW

Because each DuctSox® system is 100% custom made, there is unlimited flexibility in designing the locations of the vents or orifices. Some of the considerations when designing outlet orientation are:



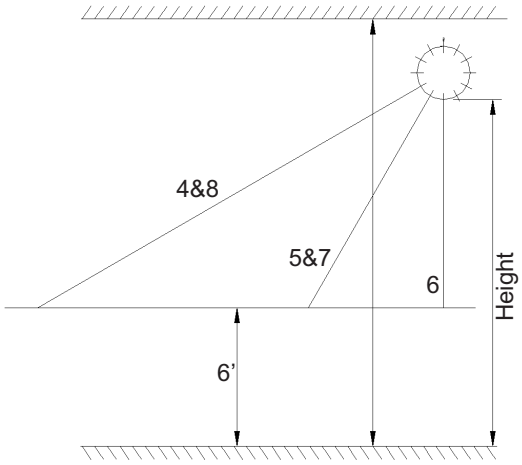
11&1, 10&2 AND 3&9 O'CLOCK

Primarily chosen for cooling or ventilating, these locations either direct the exiting air upward and / or outward from the DuctSox®. Throw requirements focus on reaching the exterior walls or filling the gaps between parallel runs.

4&8, 5&7 AND 6 O'CLOCK

Primarily chosen for applications with heating but can also be used for cooling or ventilating, these locations direct the exiting air downward and / or outward from the DuctSox®. Throw requirements can be critical in these locations because the air is delivered towards the occupied space in most cases. To calculate the throw, use the distance between the bottom of the DuctSox® system and the distance above the floor using the following equations:

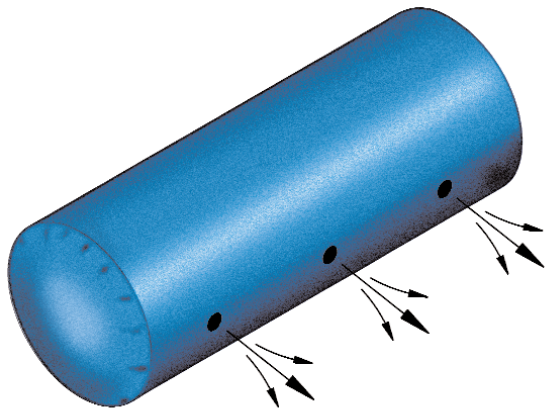
4&8 o'clock : (Height - 6) x 2.00 = Throw required
5&7 o'clock : (Height - 6) x 1.16 = Throw required
6 o'clock : (Height - 6) x 1.00 = Throw required



Note: Custom outlet orientations and patterns are available upon request

HIGH THROW DESIGN

Select orifice size and orientation based on throw that best fits the environment. Lower pressures result in improved efficiency, lower noise and extended service life.
Please note: SG Diffusers for Sedona-Xm & Coronado are only available in 2" (SG2) and 3" (SG3) diameters.



To calculate the total number of orifices - simply divide airflow volume by the Airflow per orifice (listed CFM).

ORIFICE Size	AP (in w.g.)	Airflow (CFM/ea)	Distance (ft) to Velocity (FPM)		
			150	100	50
1/2"	0.25	1.64	3	4	8
	0.5	2.32	4	6	11
	0.75	2.84	5	7	14
	1.00	3.28	5	8	16
	1.25	3.67	6	9	18
1"	0.25	6.56	5	8	16
	0.50	9.28	8	11	23
	0.75	11.37	9	14	28
	1.00	13.12	11	16	32
	1.25	14.67	12	18	36
2" SG2	0.25	26.25	11	16	32
	0.50	37.12	15	23	45
	0.75	45.46	19	28	56
	1.00	52.49	21	32	64
	1.25	58.69	24	36	72
2.5"	0.25	41.01	13	20	40
	0.50	58.00	19	28	57
	0.75	71.03	23	35	69
	1.00	82.02	27	40	80
	1.25	91.70	30	45	90
3" SG3	0.25	59.06	16	24	48
	0.50	83.52	23	34	68
	0.75	102.29	28	42	83
	1.00	118.11	32	48	96
	1.25	132.06	36	54	108
4"	0.25	104.99	21	32	64
	0.50	148.48	30	45	91
	0.75	181.85	37	56	111
	1.00	209.98	43	64	128
	1.25	234.76	48	72	144
5"	0.25	164.05	27	40	80
	0.50	232.00	38	57	113
	0.75	284.14	46	69	139
	1.00	328.09	53	80	160
	1.25	366.82	60	90	179

55+ - Indicates Theoretical Throw Value

ORIFICE SPACING

Unless otherwise specified with an order, the orifice spacing is determined by evenly spacing the orifices along the length of the DuctSox system. All systems shall include a standard 4 foot void (no orifices) near the inlet or after any fitting within a system to reduce the potential for wear.

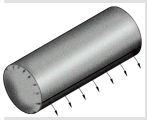
If there are too many orifices to fit within the length, then an alternating orifice pattern may have to be chosen. An example includes a 30 foot long High-Throw system that requires 120 four inch diameter orifices @ 4&8 o'clock. By standard design, there would be 5.2 inches between orifice centers, or 1.2 inch of fabric between 4 inch orifices, which would cause a serious concern for wear. In this situation, we would suggest two rows of orifices at 4&8 and 5&7 o'clock. This would increase the orifice spacing to 10.4 inches, yielding at least 6 inches of fabric between the orifices. Each application is subject to review to ensure product quality.

If custom orifice spacing is required for your application, the information should be provided at the time of quotation in order to complete the preliminary design.

4 COMFORT FLOW DESIGN

COMFORT FLOW (CF)

For Sedona-Xm, Coronado,TufTex, Verona, DuraTex, Stat-X & Microbe-X fabrics.

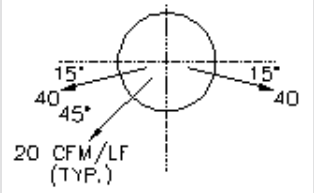


1. **Calculate Airflow through Fabric**
2. **Calculate Total Vent Size (TVS)**
3. **Select Vent Sizes (VS+VS=TVS)**
4. **Specify Vent Orientation**

$$Q_{fabric} = FP \times SA \times (AP/0.5)$$

$$TVS = \left(\frac{Q_{vent}}{(Length) \times \sqrt{(AP/.5)}} \right)$$

$$TVS = (VS_1 + VS_2 + ...)$$

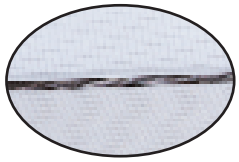


Example:
TVS=100

Vent Sizes:
40 + 40 + 20 = 100

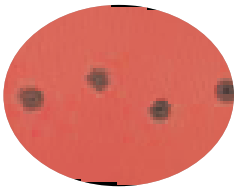
MESH VENTS

Original vent style common with many other providers. Airflow determined by vent width and Average Pressure (AP). Suggested only for food processing projects.

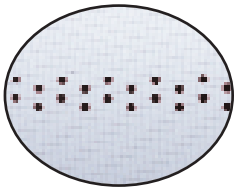


M-VENT Size	AP (in w.g.)	Airflow (CFM/ft)	Distance (ft) to Velocity (FPM)		
			150	100	50
1/8" (VS 11)	0.25	7.80	3	11	19
	0.38	9.60	7	13	20
	0.50	11.00	9	15	22
	0.63	12.40	10	16	24
1/4" (VS 22.1)	0.25	15.60	10	15	24
	0.38	19.10	12	18	29
	0.50	22.10	14	20	30
	0.63	24.70	16	22	31
3/8" (VS 33.1)	0.25	23.40	12	19	28
	0.38	28.70	16	23	30
	0.50	33.10	18	24	32
	0.63	37.10	20	25	33
1/2" (VS 44.2)	0.25	31.20	15	21	31
	0.38	38.20	18	25	33
	0.50	44.20	20	26	34
	0.63	49.50	22	27	35
3/4" (VS 66.3)	0.25	46.80	16	23	35
	0.38	57.40	21	27	36
	0.50	66.30	22	28	37
	0.63	74.20	23	29	38

L-VENTS & S-VENTS



L-Vents (Standard) are developed for a quiet and even more low maintenance vent option. The hole patterns grow larger as vent size increases.



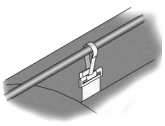
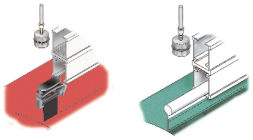
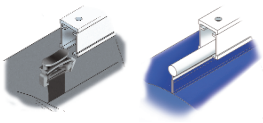
S-Vents are an array of constant diameter (3/16") orifices for all vent sizes.

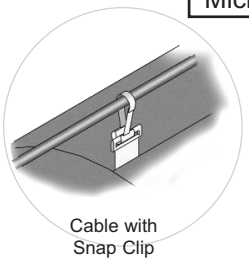
VENT Size	AP (in w.g.)	Airflow (CFM/ft)	Distance (ft) to Velocity (FPM)		
			150	100	50
5	0.25	3.5	4	5	9
	0.50	5.0	5	8	12
	0.75	6.1	6	9	15
	1.00	7.1	7	11	17
10	0.25	7.1	6	9	15
	0.50	10.0	9	13	21
	0.75	12.2	11	16	26
	1.00	14.1	12	19	30
15	0.25	10.6	8	12	18
	0.50	15.0	11	16	26
	0.75	18.4	13	20	32
	1.00	21.2	15	23	37
20	0.25	14.1	9	14	22
	0.50	20.0	13	20	31
	0.75	24.5	16	24	38
	1.00	28.3	18	28	44
30	0.25	21.2	12	18	29
	0.50	30.0	17	26	41
	0.75	36.7	21	31	50
	1.00	42.4	24	36	58
40	0.25	28.3	15	22	36
	0.50	40.0	21	31	50
	0.75	49.0	26	39	62
	1.00	56.6	30	45	71
50	0.25	35.4	18	26	42
	0.50	50.0	24	33	60
	0.75	61.2	30	46	73
	1.00	70.7	35	53	84
60	0.25	42.4	19	28	45
	0.50	60.0	26	39	63
	0.75	73.55	32	48	77
	1.00	84.9	37	56	89

Note: All are isothermal throws as a free-air jet. Actual throw velocities will vary in each environment. To ensure comfort, specify vent orientation as needed per vent and section.

SUSPENSION 5

The final step of design is selecting the suspension method. The following table details suspension availability based on fabric selection.

Fabric	Cable with Snap Clip 	Suspended H-Track & Flush Mount with Snap Tab 	Suspended H-Track & Flush Mount with Cord-In 	
Coronado	O	O	O	O
Sedona-Xm	O	O	O	O
TufTex	O	O	O	O
Verona	O	O		O
DuraTex	O	O		O
EkoTex	O			O
Stat-X	O	O	O	O
Microbe-X	O	O		O

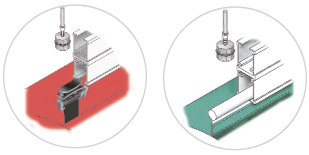


Cable with Snap Clip

TENSION CABLE

Simple tension cable is available for all fabric options and is the most economical option. Available for all sizes - Cable suspension is available for one and two row suspension options **(2 row required at 32" diameter and larger)**. Snap Clips are spaced every 24 inches along the length to ensure proper support.

The system consists of a cable, turnbuckle(s) and securing hardware for a simple installation. Cable components available in galvanized, 316 Stainless Steel and plastic coated S/S cable.

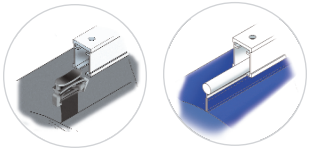


Aluminum H-Track with Snap Tab or Cord-In

SUSPENDED H-TRACK

Anodized aluminum track includes an open top and bottom to allows easy location of vertical supports and clear connection to the DuctSox below. H-Track is available for most fabric options. Available for all sizes, H-Track suspension is available for one and two row suspension options **(2 row required at 32" diameter and larger)** and may include radius sections for elbows. Snap Tabs are spaced every 24 inches along the length to ensure proper support. Cord-In attachment option allows for continuous support for smaller diameter sections.

The system consists of 10 foot sections of H-Track, couplers, end caps, locking cable drop supports and Gripple cable lock devices for easy installation. Supporting hardware components are available in galvanized or 316 Stainless Steel.



Aluminum Flush Mount with Snap Tab or Cord-In

FLUSH MOUNT TRACK

Anodized aluminum track is available for select fabric options and is designed to be affixed to a flat surface using anchors or T-Bar snap clips. Flush Mount Track is available for one row suspension option - and all Surface Mount Models. Snap Tabs are spaced every 24 inches along the length to ensure proper support. Cord-In attachment option allows for continuous support for smaller diameter sections.

The system consists of 12 foot sections of Flush Mount Track, couplers, end caps and - if required - T-Bar connection clips for a installation to common T-Bar ceiling.

3 X 1 Suspension with hangers on a single tension cable

3 X 1 SUSPENSION

System only requires a single tension cable and a series of 3 X 1 Hangers

D-Clasps connect product at 10 & 2 o'clock, 3 X 1 hangers attach to tension cable at12 o'clock.

Fewer knee braces are needed.

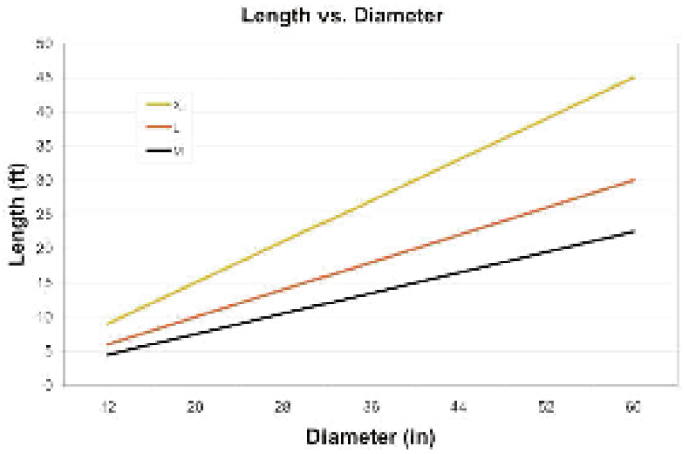
FINAL FILTER

The DuctSox Final Filter is a simple replaceable cone shape filtration device that is available from DuctSox Corporation exclusively. Affixed at the inlet with a zipper, the filter is completely concealed within the DuctSox. Considering layout conditions, a DuctSox Final Filter may not be applicable for every project.

The Final Filter is available in two types and three lengths (M, L & X). Design considerations include physical space required and required supply static pressure.

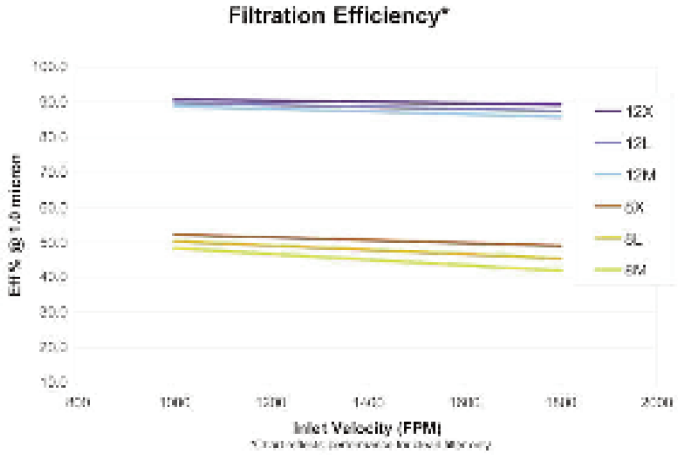
SPACE CONSIDERATIONS

DuctSox Final Filters are available in all diameters and in three different lengths: M, L or X. The shortest, or M length filter is 4.5x the diameter in length, the L and X are 6x and 9x respectively. Longer filters offer increased surface area which improves filtration performance and extends the effective life.



FILTRATION EFFICIENCY

Filtration efficiency is a measure of the amount of particle captured by the filter media at a given particle size. This rating varies based on particle size, face velocity, filter loading (clean versus dirty) and dynamic conditions (movement). Based on performance testing, our filters are MERV-8 (~ 50% efficient) or a MERV-12 (~ 90% efficient).

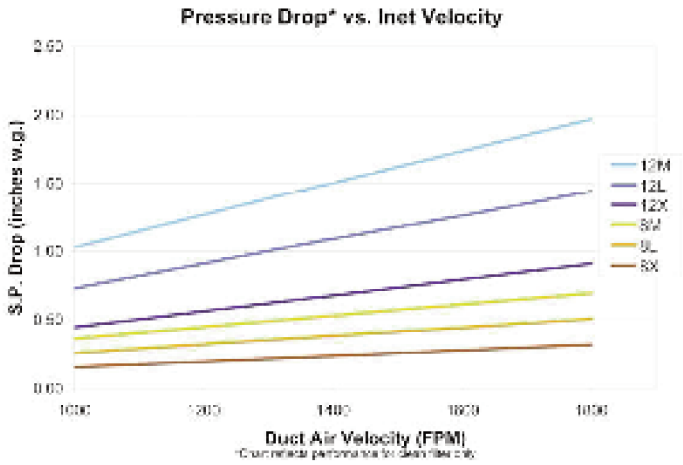


PRESSURE LOSS

Another key performance consideration is the filter pressure drop. Depending on filter media, length and inlet velocity the pressure resistance ranges from 0.15"-0.59" w.g. (MERV-8) and 0.44" - 1.97" w.g. (MERV-12) clean. Performance testing has proven the filter maintains it's effectiveness at 3.2x the original pressure drop.

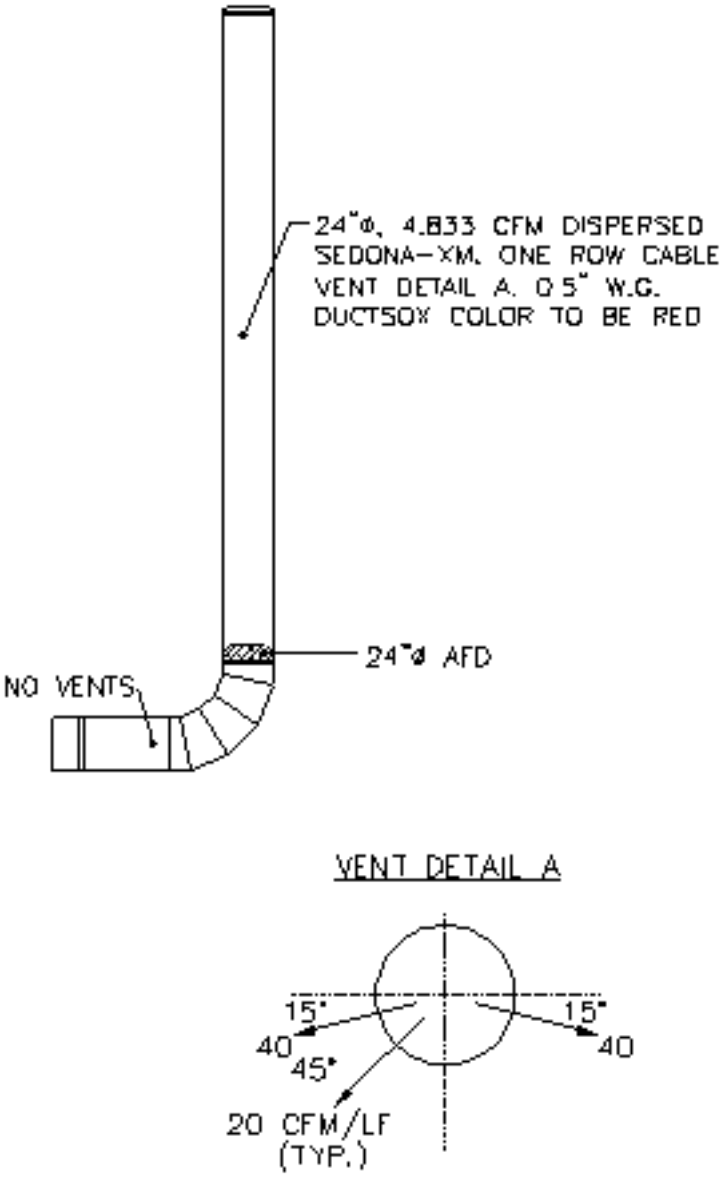
LIFE EXPECTANCY

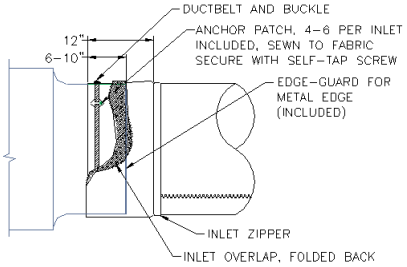
The effective life of the final filter will vary based on efficiency of the prefilter, the final filter and the amount of airborne particles. Higher efficient filters capture more particles and typically offer a shorter life expectancy than lower efficient options. In application tests, the effective life ranges from a few months - to a year. A secondary pressure monitoring device may be added to the system design to monitor the filter pressure to ensure proper maintenance (not provided by DuctSox Corp.).



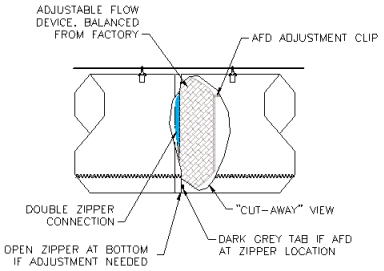
SAMPLE CAD DETAILS

The graphical, or CAD portion of design is the critical to convey design intent to the construction team. More than including the layout details as shown below, adding detail drawings (right) highlight specific details of the components, airflow type & orientation, suspension type or inlet connection. Considering these details vary by fabric, access www.ductsox.com [techical library] to download current complete details.

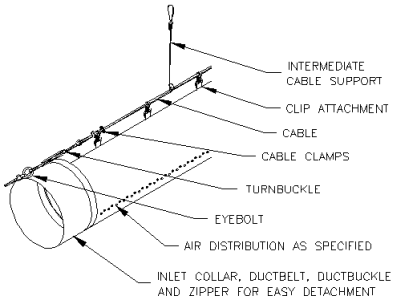




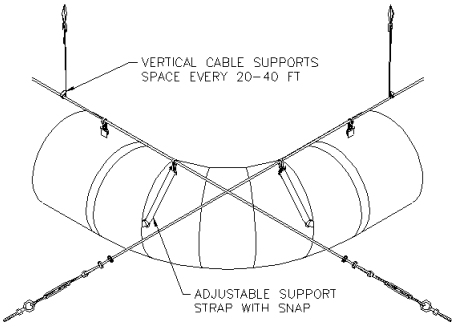
INLET ATTACHMENT DETAIL
SEDONA TYPE WITH ZIPPER AND OVERLAP



ADJUSTABLE FLOW DEVICE (AFD)
INSTALLED AT ZIPPER LOCATION AT INLET OR AS SPECIFIED IN OTHER LOCAITONS. ZIPPER TO ZIPPER CONNECTION AS SHOWN. EXTERNAL LABEL IDENTIFIES LOCATION



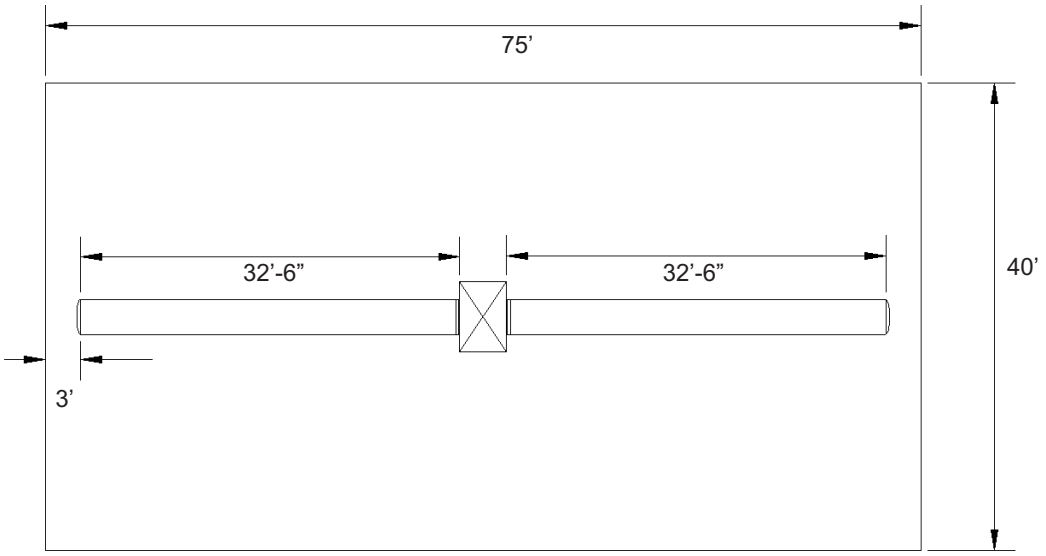
SUSPENSION DETAIL
1 ROW CABLE SUSPENSION AT 12 O'CLOCK



SUSPENSION DETAIL
RADIUS ELBOW, 1 ROW CABLE SUSPENSION

Complete drawing details and specifications are available at www.ductsox.com

SAMPLE COMFORT-FLOW DESIGN



1 **Series / Shape**: Open ceiling = Cylindrical

2 **Design Layout**: Centrally located unit and higher open ceiling (16 foot - not shown) allows for a simpler layout. Diameter is selected for normal inlet velocity (<1,600).
Diameter: 16" at 1,433 FPM

3 **Fabric Selection**: Sedona-XM fabric is selected for extended warranty and custom color.

4 **Air Dispersion**: L-Vents are selected (std.).
System pressure is at 0.45" w.g.
Airflow through fabric: 288 CFM
Airflow through vents
Vent detail: size 15 at 4&8 o'clock
size 10 at 5&7 o'clock

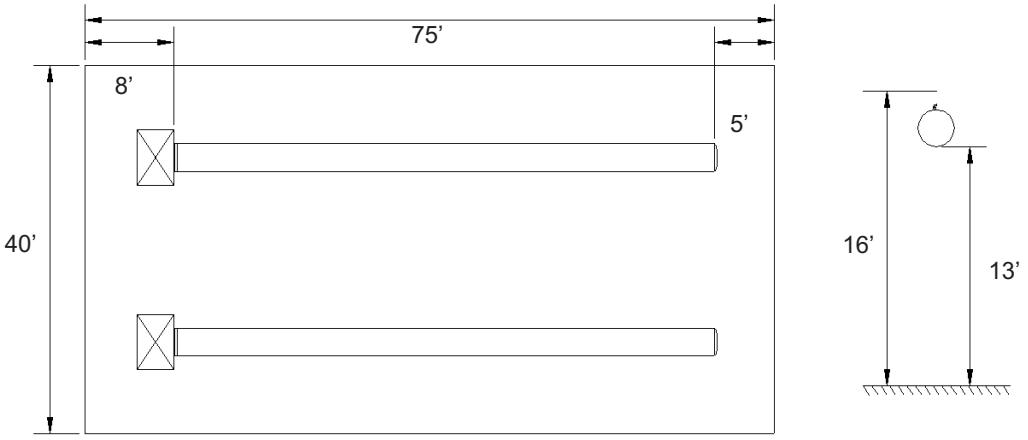
5 **Suspension**: Considering the DuctSox will be mounted against the bottom of the truss - a one row cable suspension with snap clips is selected for an easy / low cost installation.

Using the available "Designer" - the design steps are much simpler. Contact your local DuctSox rep to get the most current version.

Airflow	2000	cfm
Diameter	16	inch
Length	33	feet
Inlet Velocity	1433	fpm
Inlet Static Pressure	0.45	in of H_2O
Velocity Pressure	0.13	in of H_2O
Frictional Losses	0.02	in of H_2O
Average Pressure	0.52	in of H_2O
Maximum Pressure	0.56	in of H_2O
Fabric Porosity	2.00	cfm/ft^2
Fabric CFM	288	cfm

	Vent Set #1	
% of Air to Disperse	100%	
Number of DuctVents	2	Vents
DuctVent CFM	1712	cfm
L-Vent Size	25	cfm/ft

SAMPLE HIGH-THROW DESIGN



1. **Series / Shape**: Open ceiling = Cylindrical

2. **Design Layout**: Roof mounted unit wth two drops coming into the space (as shown). Simple straight runs - diameter is selected for normal inlet velocity (<1,600).
Diameter: 38" at 1,522 FPM

3. **Fabric Selection**: TufTex fabric is selected as it's the premium option for High-Throw, extended warranty and available Blue color.

4. **Air Dispersion**: This manufacturing facility required throw and mixing = High-Throw Series.
System pressure is at 0.5" w.g.
Airflow through fabric: 0 CFM
Airflow through orifices: 12,000
Orifice detail: 298: 2" Dia at 4&8 o'clock
4' void - 4.62" spacing

5. **Suspension**: Considering the DuctSox will be mounted 24 inches below the structure - a two H-Track suspension with snap tabs is selected for an easy / low cost installation.

Using the available "Designer" - the design steps are much simpler. Contact your local DuctSox rep to get the most current version.

Airflow	12000	cfm
Diameter	38	inch
Length	62	feet
Inlet Velocity	1524	fpm
Inlet Static Pressure	0.50	in of H_2O
Velocity Pressure	0.14	in of H_2O
Frictional Losses	0.01	in of H_2O
Average Pressure	0.59	in of H_2O
Maximum Pressure	0.63	in of H_2O

	Orifice Set #1	
% of Air to Disperse	100%	
Orifice Size	2.00	inch Dia
CFM / Orifice	40.31	cfm
Orifice Quantity	298	
# of Orifice Rows	2	
Void to First	4	feet
Orifice Spacing	4.62	inches

Throw at Design Pressure (150 ft/min Terminal Velocity)

Orifice Diameter					
0.5"	1"	2"	3"	4"	5"
4.3'	8.5'	17.1'	25.6'	34.1'	42.7'

EQUIPMENT SPECIFICATIONS

When designing any DuctSox® system, many different factors contribute to the final design. AHU outlet diameter, external static pressure, outlet airflow velocity, room height, length (minimum or maximum) and width, and more, all must be considered in a proper design. The following section includes suggestions to consider when designing a new system or a retro-fit to existing equipment. DuctSox® systems, offer a variety of suspension system options and fabrics that also must be chosen to fit both the proper suspension requirements and the decor of the environment.

NEW CONSTRUCTION
When designing a system for a new application or use with a new AHU unit, equipment specifications should include outlet velocities specific to the fabric and series and an external static pressure of ½" w.g. at the DuctSox® inlet. Standard centrifugal blowers typically work well for a DuctSox® system. Filtering the air before it gets into the DuctSox® system is required with any of the permeable fabrics. While a 30% efficient filter is suggested, better filters reduce the dirt that gets into the system. Less dirt in the system means less cleaning, resulting in a longer product life.

RETRO-FIT / EXISTING SYSTEMS
Existing units have typically been designed for metal ductwork and registers, not including the additional static pressure required to properly inflate a DuctSox® system. Therefore most existing systems may include removing all of the existing metal ductwork and installing a complete DuctSox® system. Other options may include a combination of booster fans and dampers to properly balance the static pressures needed.

Other additions, such as metal collars, fittings or supports may also be required to properly connect the inlet and the suspension system. If you have any questions or problems getting the information you need, you may call our customer service group for assistance. The information can typically be found by contacting the manufacturer and giving them your model & serial number.

AHU CONTROLS

STANDARD THERMOSTAT CONTROLS
A system controlled by a standard thermostat should be set on continuous fan duty. It is important to note that standard settings, without constant duty, will include inflation and deflation stages of the DuctSox® system. In different environments, some may find this distracting. Extreme cycling, especially with single row suspension systems, may cause premature failure of the system due to inflation impact stress.

VARIABLE AIR VOLUME (VAV) BOXES / CONTROLS
With an emphasis on indoor air quality and the extended development of motor controllers, variable air volume systems are common. Considering the DuctSox system operates on positive pressure - it is important to match the airflow curve and relative pressure curve to ensure adequate inflation on the low side and available inlet static pressure on the high volume side. Typically - DuctSox maintains an "acceptable" inflated appearance down to 1/8" w.g..

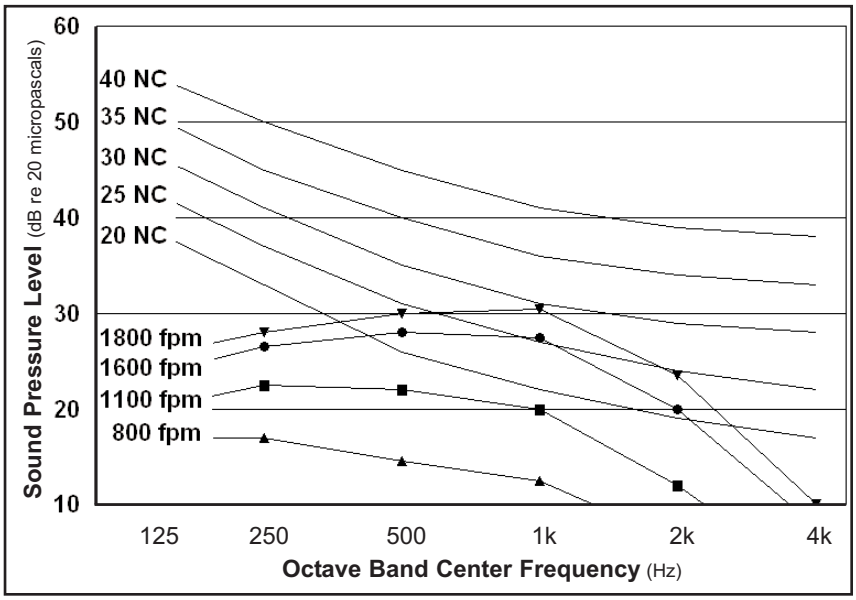
FREQUENCY DRIVE / SOFT START CONTROLS
In order to reduce the "popping" that may be experienced upon inflation, a solution may include the use of a frequency drive or soft start motor controller to ramp up the speed of the fans. This will greatly reduce the initial surge of airflow that causes most of the stress on a fabric DuctSox® system. Adjustable Flow Devices (AFD's) can also be used to reduce the initial surge of airflow upon start up.

TWO SPEED / STAGING FANS
For larger industrial / commercial HVAC systems, a two speed fan or a staging fan may be considered. Either option will operate with the primary purpose of keeping the DuctSox® system inflated when the HVAC system is not operating. When the system is switched into second stage, the system is already partially inflated. Considering the system is already inflated, this option virtually eliminates any concern of inflation pop.

SOUND DATA

Noise within an HVAC system is commonly generated by either the equipment or the airflow. Equipment noise is typically captured using sound attenuation components and air noise is reduced by designing with lower airflow velocities and lower static pressure.

Unlike traditional metal systems, DuctSox® Air Dispersion Products are fabricated of a flexible fabric that does not block, conduct or convey noise. To properly consider the acoustical aspects of design, please review and consider the following: "Equipment" noise, "Velocity" noise and "Pressure" noise.



Equipment Noise references noise generated by something external of the DuctSox system, which could include an air handling unit, fan, VAV box, or fan-powered box. This noise can be contained in, and travel down, metal duct work prior to the DuctSox System. When this conveyed equipment noise reaches the DuctSox, it will "break out" of the fabric duct almost immediately because the fabric is not a noise "barrier". The best way to prevent this from occurring is to include a noise attenuator to absorb the noise before it enters the DuctSox system.

Velocity Noise refers to the amount of noise generated by the velocity of the airflow entering the DuctSox at the inlet. As with any system, higher velocities result in more noise, and lower operate quieter. There are four data lines on the chart, reflecting average inlet velocities of 800, 1100, 1600 and 1800 FPM into a 16" diameter DuctSox system at .5" w.g. static pressure.

NC vs. Inlet Velocity	
(ft/min)	NC Level
800	<20
1,100	<20
1,600	25
1,800	30

NOTE: Sound Power Levels adjusted for > 15,000 cubic feet space with DuctSox installed 16 ft above the occupied zone.

Pressure Noise identifies the amount of noise generated by the air outlets. Systems operating at a higher static pressure push additional air through the outlets. This increased airflow emits higher noise levels than lower airflows. During design, maintaining a static pressure **at or below 0.5 in w.g.** will effectively eliminate concerns of noise generated due to static pressure (below audible range).

Sample Sound Data Chart

Performance chart detail performance characterics of test sample only (Sedona-Xm, S-Vent at 0.5" w.g.). Actual results will vary based on airflow type, fabric, static pressure, room size and DuctSox location.

For best results with noise sensitive projects, please contact our factory representative for free engineering support.

Noise Absorption characteristics of DuctSox products also help reduce the ambient sound within an environment. The soft flexible fabric acts as a baffle along the ceiling, reducing sound by breaking up small amounts of reflective noise. Independent testing revealed:

Noise Reduction Coefficient (NRC): 0.20
Sound Absorption Average (SAA): 0.17-0.21

More detailed test results of Absorption Coefficient vs. Frequency are available if requested.

WARRANTY & CODE COMPLIANCE

Design & Performance Warranty

For the first year of operation - each DuctSox system designed and operating within the published guidelines is covered by a design and performance warranty. To assist through the design process, we freely offer our published design manual on our website or provide design assistance through our inside sales and engineering group.

DuctSox Product Warranty

The DuctSox Warranty is for replacement or repair credit based on the amount of the warranty period remaining. The warranty is not available in the form of a cash payment, only as credit towards repair or replacement. The DuctSox Warranty covers materials, fabrication and performance of the fabric portion of the DuctSox System only. Warranty coverage begins at time of shipment.

Material	Warranty Period	Application Requirements
Sedona-Xm, TufTex, & Coronado	10 year, prorated years 5-10	Airflow & Static Pressure per original DuctSox design in accordance with published requirements at the time of shipment.
Verona, DuraTex & Stat-X	5 year, prorated years 2.5 - 5	Same as above
EkoTex & Microbe-X	1 year	Same as above

Warranty excludes damage to fabric from improper installation, poor maintenance, abuse, abrasion, caustic chemicals, exposure to high temperature (over 180 degrees F), fabric discoloration and shrinkage or any unauthorized modifications to system. Warranty does not cover any labor, equipment rental or freight charges incurred as a result of executing the warranty.

Code Compliance

As drafted by the International Code Council, (ICC), Acceptance Criteria for Fabric Air Dispersion Systems (AC-167) is the most comprehensive compliance requirement assembled for the fabric duct industry. More than just a measure of safety, quality and performance, when combined with our classification to this standard by Underwriters Laboratories (UL) ensures continued compliance for all marked products. Additional information is available at www.ductsox.com.

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