The Proper Three are the Key: Dust Collection for Small Shops

Presented by

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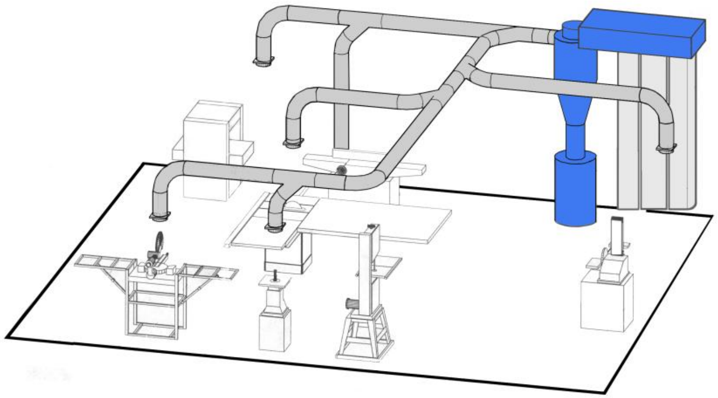
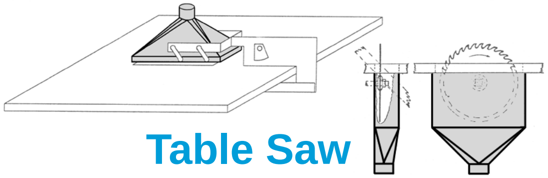
The Proper 3 are the key for Successful Dust Control!

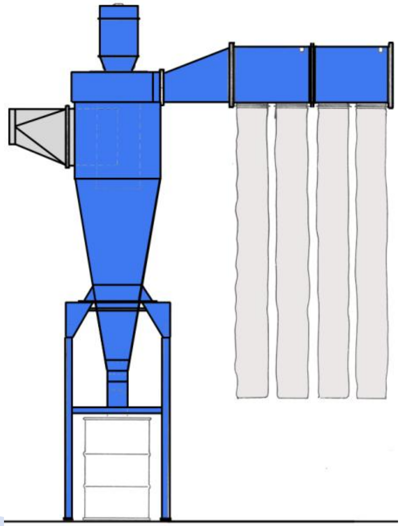
1. Piping for a Central Dust Collection System.



2. Hooding



3. Dust Collectors



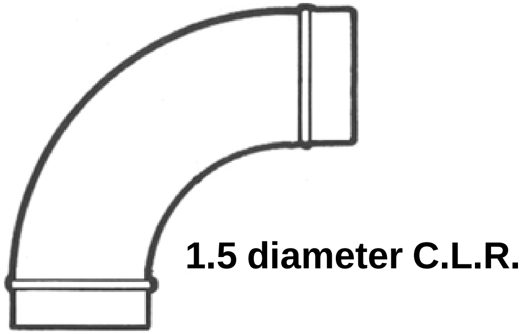
Piping – Galvanized Spiral Pipe

- Compared to non-round duct, Spiral Pipe has better rigidity, keeps air velocity more uniform to avoid settling of material, and provides for lower friction loss.
- Spiral Pipe – withstands vacuum due to exterior spiral support. Airtight, excellent for industrial exhaust, longer lengths.
- Snap Lock Pipe – NOT designed for vacuum, Meant to be “blow through,” shorter lengths.

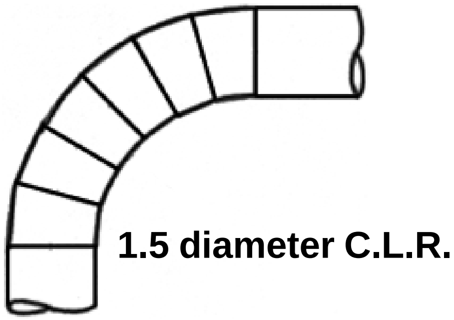
Allowable Negative Pressures in Round Spiral Pipe

Diameter	0”-10” W.G.	10”-20” W.G.
3”-7”	26 Ga.	26 Ga.
8”	26 Ga.	26 Ga.
9”-12”	24 Ga.	24 Ga.
13”-15”	24 Ga.	22 Ga.
16”-18”	22 Ga.	20 Ga.
19”-22”	22 Ga.	18 Ga.
24”-26”	20 Ga.	18 Ga.

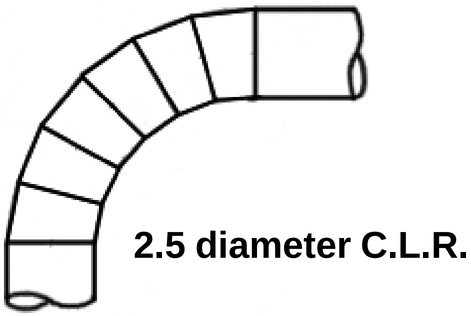
Piping - Elbows



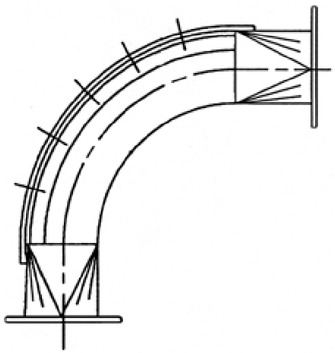
Die Formed Smooth
(PREFERRED)



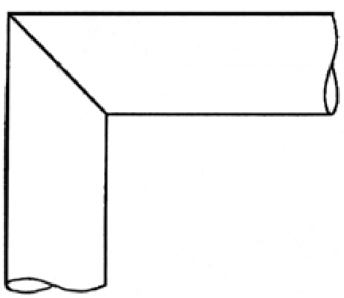
Gored
(ACCEPTABLE)



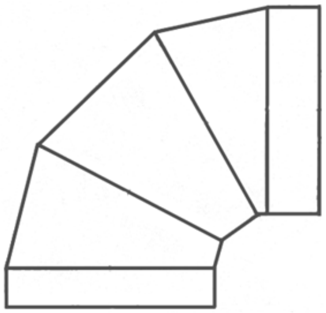
Gored
(ACCEPTABLE)



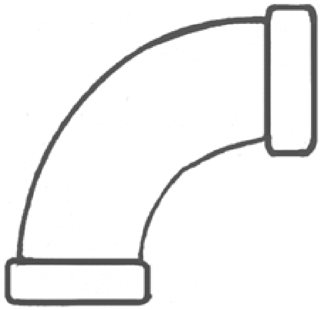
Flat Back
(SPECIAL)



Mitered
(AVOID)



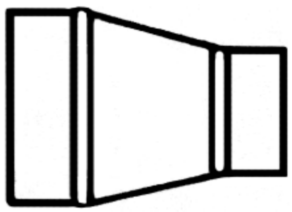
Heating
Short Radius
(AVOID)



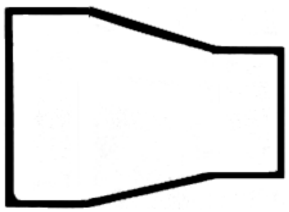
PVC Short
Radius
(AVOID)

C.L.R. = Center Line Radius

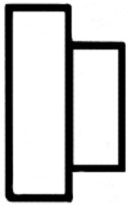
Piping - Reducing Fittings



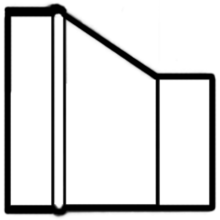
FABRICATED
Tapered Reducer



SPUN
Tapered Reducer

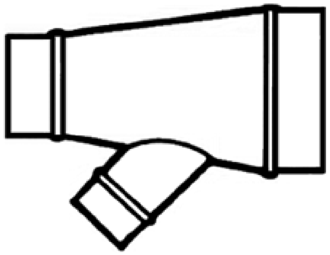


Flat Reducer
(AVOID)

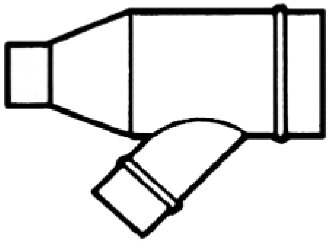


Eccentric Reducer
(AVOID)

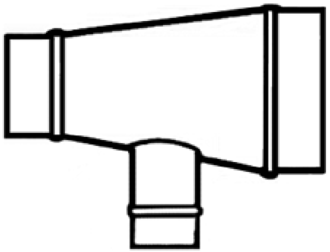
Piping - Junction Fittings



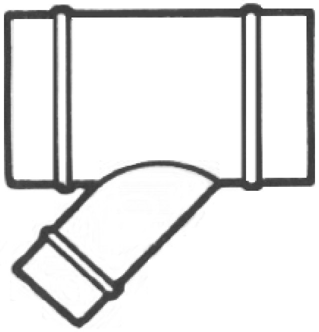
45^{O} Tee on Taper
(PREFERRED)



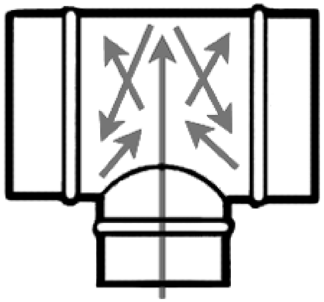
45^{O} Reducing Lateral
(Acceptable)



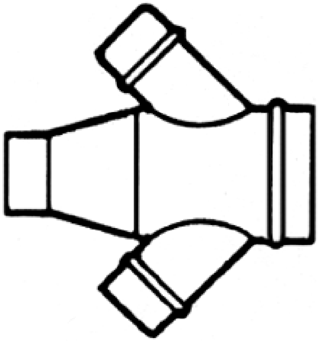
90^{O} Tee on Taper
(AVOID)



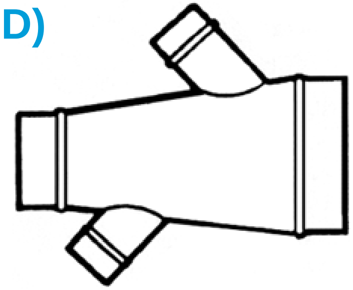
45^{O} Lateral
(PREFERRED)



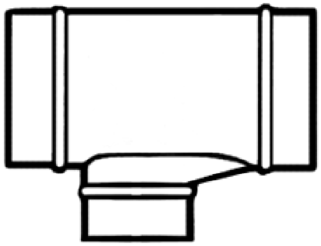
90^{O} Bull Head Tee
(AVOID)



45^{O} Double Cross
Reducing Lateral
(AVOID)

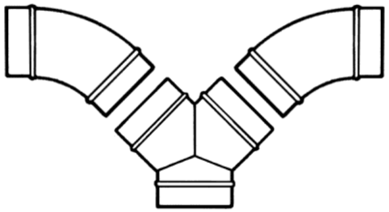


45^{O} Double Cross Tee on
Taper (PREFERRED)

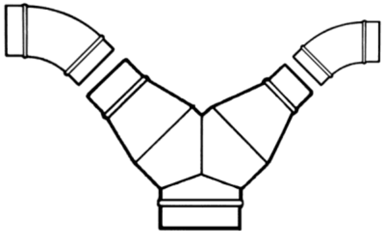


Boot Tee

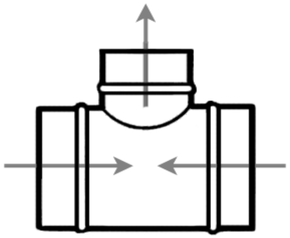
Piping - Junction Fittings



Y-Branch



Reducing Y-Branch



(AVOID)

- All branches should enter the main at a maximum of a 45^{O} angle.
- To minimize turbulence and possible material fall out, branches should enter the side or top of the main duct.
- The duct in a tapered system gradually gets larger as additional branches are merged together, therefore keeping duct velocities nearly constant.

Piping - Flexible Hose

Rubber (RFH) - Cost effective; Relatively smooth bore, does not develop static like PVC; Recommended for saws, shapers, jointers; Outdoor Use, Chemically Bonded.

Polyester Encapsulated in Thermoplastic Rubber - Flame Retardant; Mild abrasion; Indoor Use; General Purpose.

Urethane - Abrasion resistance, Puncture Resistance, & Tear Strength. Relatively smooth bore. Outdoor use. Recommended for CNC Routers. Available in various mil thickness, 20 mil, 30 mil, 45 mil, 60 mil

Wear Strip Option - Protect Exterior of hose; Recommended for hose that will lay on or be dragged over floor.

Also available in METRIC - Metric size has been developed to meet the needs of imported machinery.

Tip - Keep flex hose to minimum, it has three (3) times the drag (resistance) as straight pipe and it is as much as five (5) times the cost. Remember, it is a wearable item.

Piping - Flexible Hose - QFD

Piping - Blast Gates

Full Gate - Installs between pipe or pipe and flex hose. Use in NEW installations. Positive shutoff. Used for Balancing. Diverts suction from one line to another.

Half Gate - Saw Cut Halfway around pipe (1/4" wide).   Fasten to outside of pipe. Installs easy on existing pipe run. Good for paper trim, Moist or sticky materials. Not a completely positive shut off.

Self Cleaning Gate - Installs between pipe or pipe and flex hose. Positive shut-off. Use for conveying moist or sticky material. Use if gate mounted in a horizontal run.

Blast gate Connector (BC) - Pop rivet to outside of gate collar. Slip flex hose over and clamp.

Piping - Floorsweep

At clean-up time, open gate on top of Floorsweep. Close Blastgates on machinery and divert suction to Floorsweep drop.

IMPORTANT: Do not use on a system where debris hits the fan first.

Starter Collar

Tap to flat surface. Make your own hood. Hang dust bag from plenum.

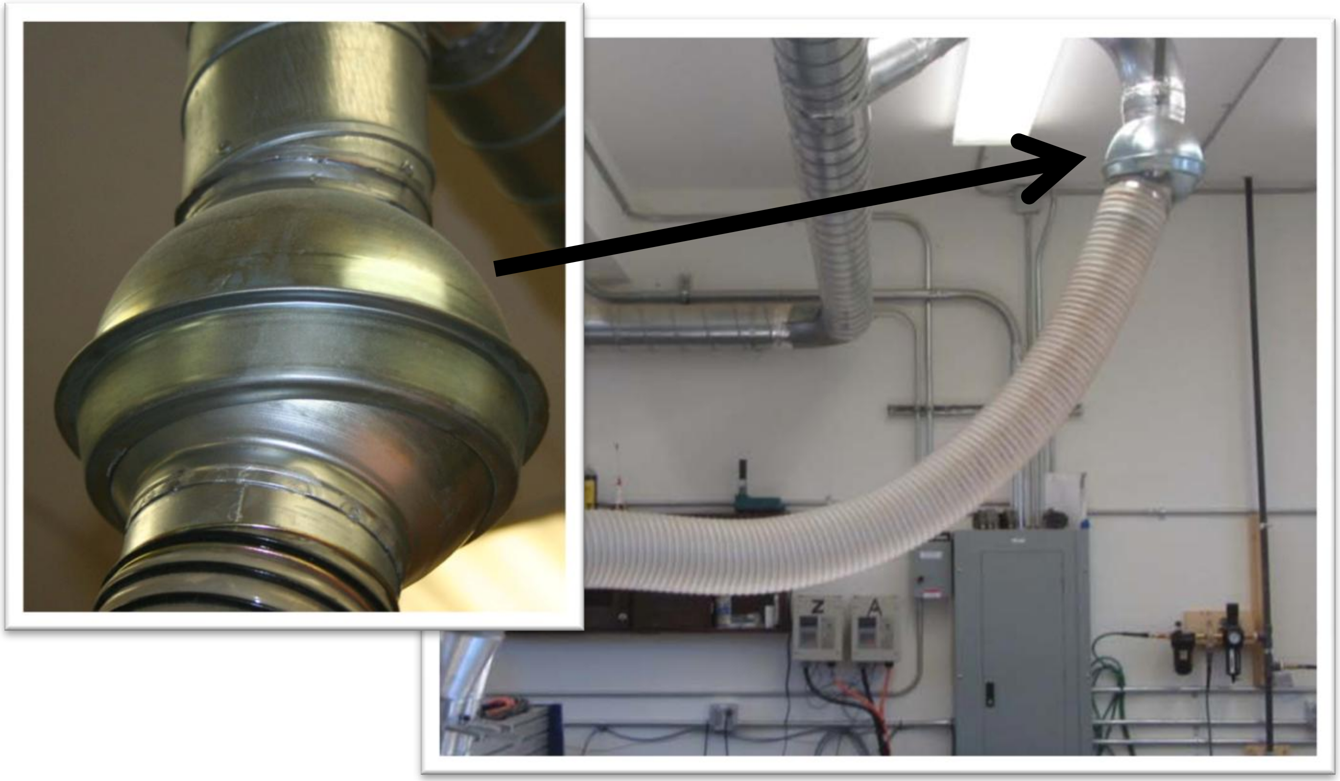
Bellmouth

Tap to flat surface. Optimum flow fitting.   Requires more space than Starter Collar.

45º Saddle Taps

Ideal for tapping into EXISTING pipe runs.

Piping - Ball Joint



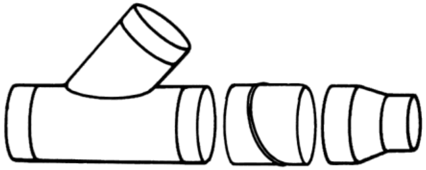
Swivel Ball Joints are used for traversing machinery. Swivel Ball Joints with EXTENDED collar connects to flexible hose allowing free rotation. Many suppliers (manufacturers) provide ball joints with 1" long collars. Make sure you purchase with extended collars in order to properly secure your flex hose.

Piping - Connections

Pipe-To-Pipe Connections

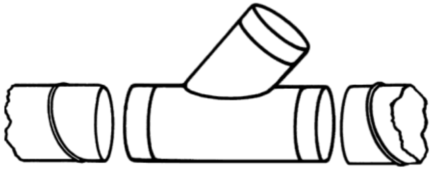
Spiral pipes are connected together by a sleeve type coupling (Part No. COUP). The coupling has a small-end and is slipped into the pipe sections.

Fitting-To-Fitting Connections



Fitting-to-Fitting connections can be made by cutting a short length of Spiral Pipe and using this length of duct as a female coupling or by ordering a type COU2 Female coupling.

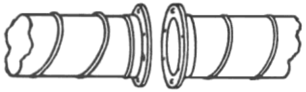
Fitting-To-Pipe Connections



All fittings are sized to slip into mating pipe sections or flex hose. No additional coupling will be needed.

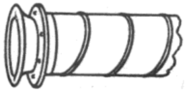
Piping - Connections

Welded Flanges



Welded flanges may be solid-welded or tack-welded and sealed with caulking. Then connect flanges together with nuts & bolts

Vanstone Flanges



Slide ring over end of pipe, let 1/2" of pipe stick out. Use a clamp to hold the ring in place. Then use a ball peen hammer and peen over the 1/2" back to the ring.

ECS - Easy Connect Sleeve

Draw band style with gasket

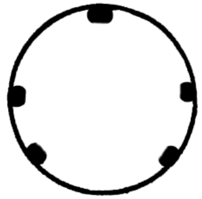
Clamp Together

Uses barrel-type clamp

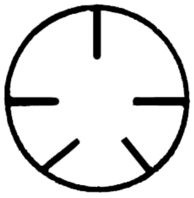
Piping - Airtight

- Air Tight – It is critical that the piping used in a dust collection system is air tight.
- All field connections must be sealed.
- It is imperative that the system is air tight from the dust collector to the machinery.
- Air tightness in conjunction with proper piping will optimize the dust collector's performance capability.

Piping - Pop Rivets vs. Screws

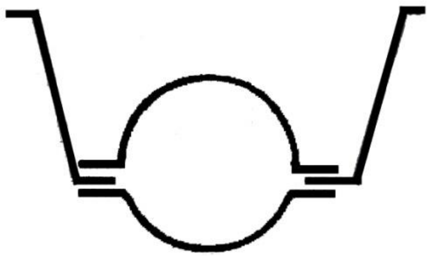


Pop Rivets



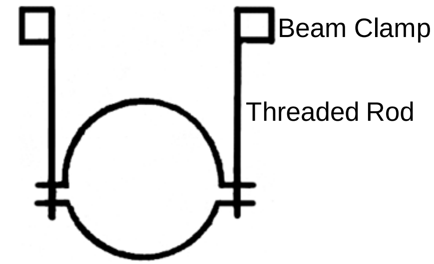
Screws

Piping - Hangers



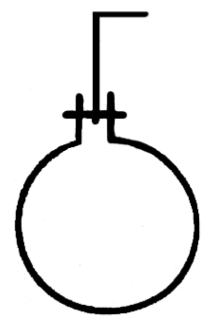
Heavy Duty Hanger
with Strap
Angle Strap out away from pipe on approx. 15 degree angle. This will prevent sway.

Heavy Duty Hanger



Heavy Duty Hanger
with Threaded Rod

Single Suspension Hanger



Single Suspension Hanger
with Strap

Hooding

- Capture at the source
- Try to encompass area where dust is being generated without interfering with the operation.

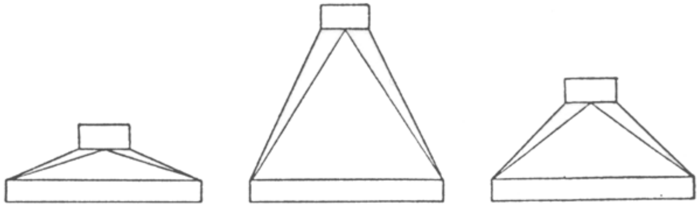
Three important factors when designing a hood.

1. Shape of the Hood. It must be shaped to allow material to travel in a straight line to hood outlet without suction. Otherwise, angle of deflection is critical. (Note: Radial Saw Hood.)
2. Size of the Hood and it's opening. Hood should be as small as possible, yet large enough to arrest the dust. The angles used in reducing the face opening to the outlet must not be too sharp or too flat. Angle of impact should not be more than 60 degrees.
3. Size of branch pipe and coinciding air volume will depend upon size of Hood and amount of waste being generated.

Notes:

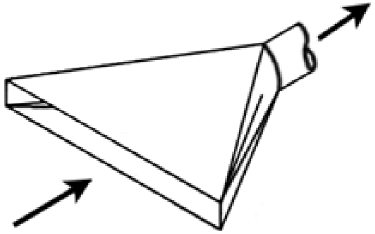
- Make prototype Hoods out of heavy cardboard. Once the right Hood is developed, duplicate out of metal.
- Volume required for a machine with a factory Hood will depend upon outlet diameter and branch velocity. Example: 4" diameter requires 350 CFM at 4,000 FPM branch velocity.
- Hoods must be made large enough to cover all areas from which material could escape, but not any larger than necessary. The LARGER the Hood the more air volume required.

Lengths of Hoods

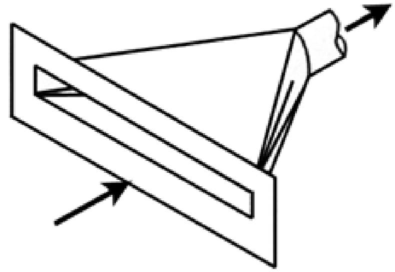


Too Short   Too Long   Proper Length

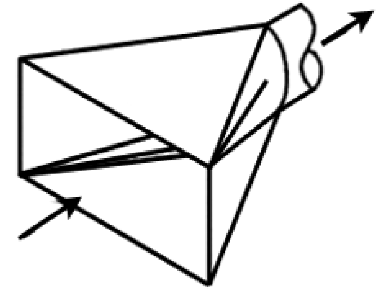
Hooding Types



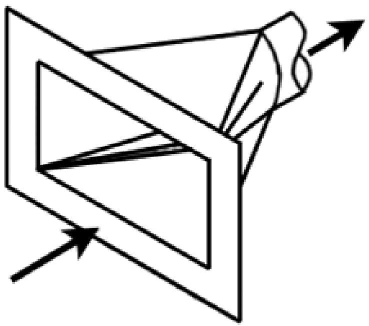
Slot



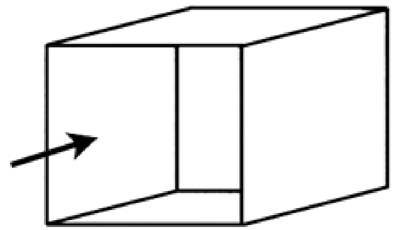
Flanged Slot



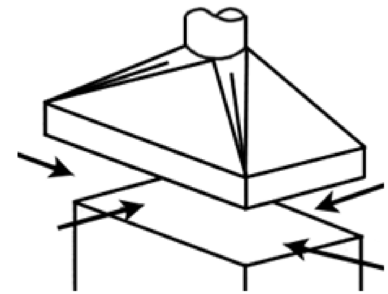
Plain Opening



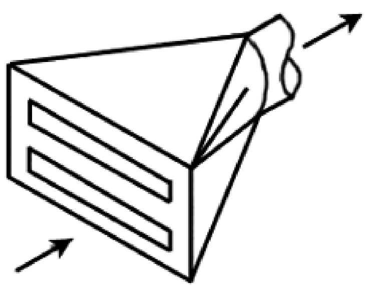
Flanged Opening



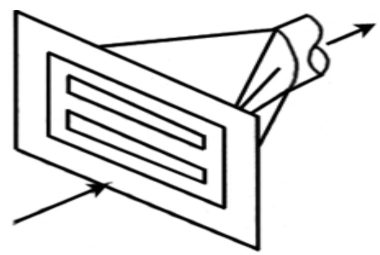
Booth



Canopy



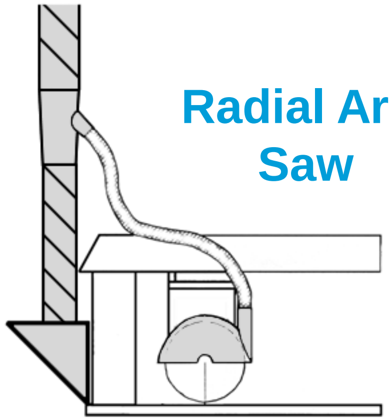
Plain Multiple



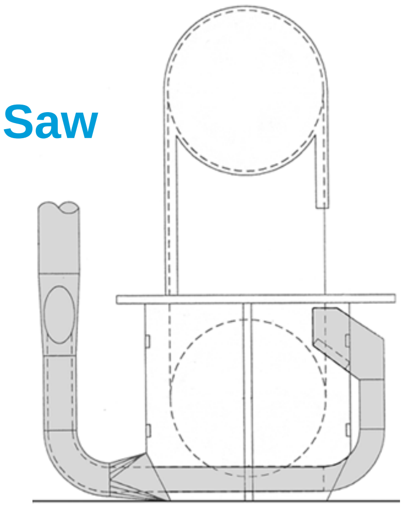
Flanged Multiple

Hooding Examples

Radial Arm Saw



Band Saw



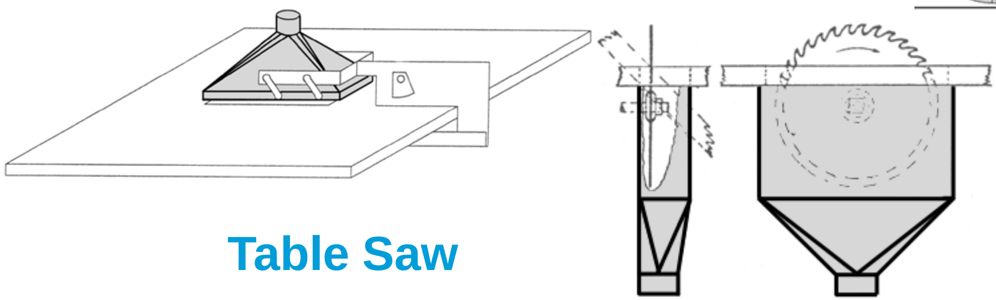
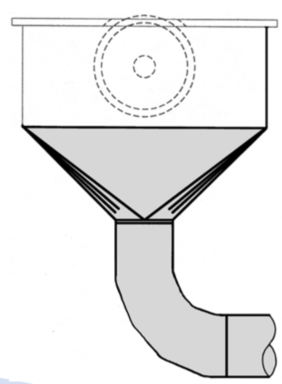


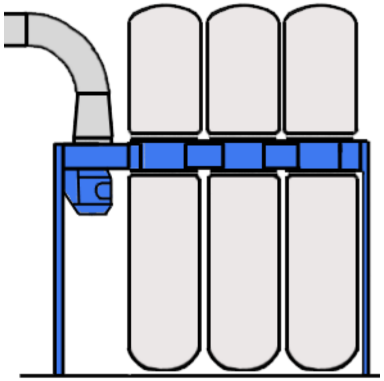
Table Saw

Single Drum Sander

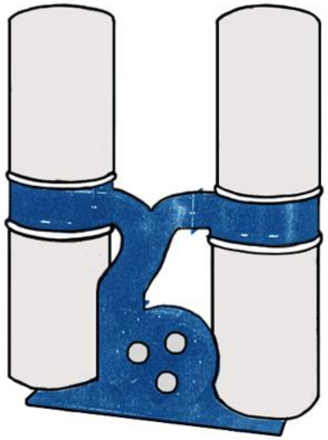


Dust Collectors

Dust Collectors - Single Stage

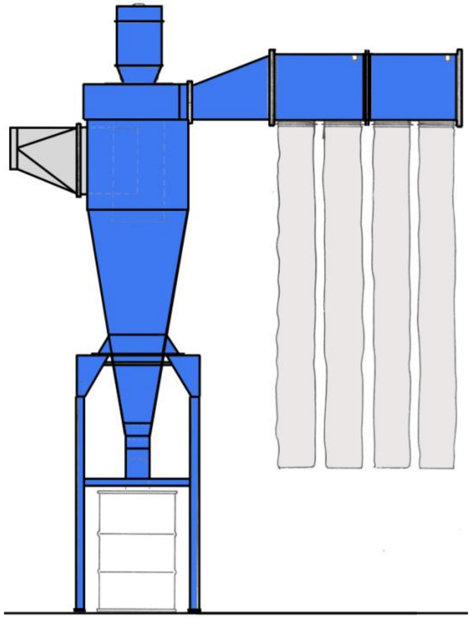


Single stage dust collector
(Blower and Filters ONLY)

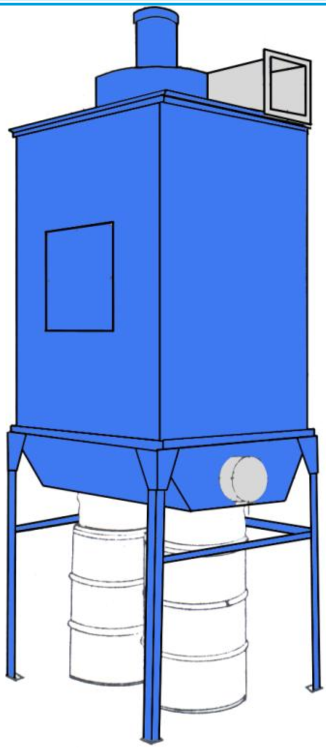


Dust Collectors - Two Stage

- 2 stage dust collector
  (Cyclone, Blower and Filters)
- Cyclone style with after filter
- Used for large particles

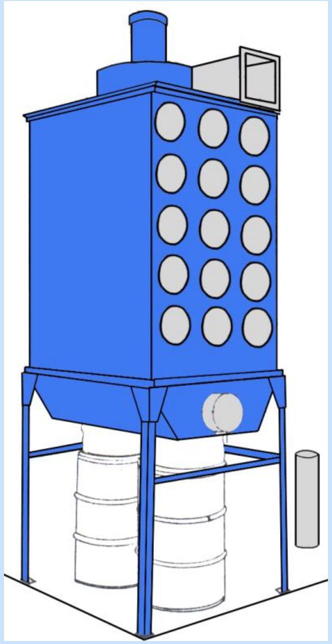


Dust Collectors



Bag House

- Fine dust
- Bags DO NOT clean as efficiently as cartridge unit
- Larger than Cartridge unit with equal amount of filter area.



Cartridge Collector

Cartridge Filtration - Fine Dust

Pulse jets of clean air dislodge particles from the filter cartridge. A timer activates compressed air to clean filters on a continual basis.

Dust Collectors - High Velocity Vacuum

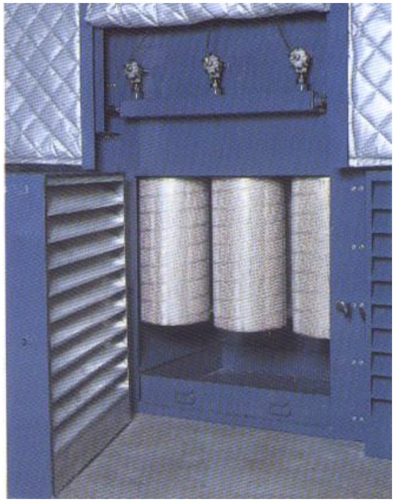
Portable High Velocity Vacuum with handheld sander

- Hand held power tools with long small diameter hoses attached.
- For central high velocity vacuum systems
- High suction/low volume

High Velocity Dust Collector

Eurovac has two types of dust collectors for source capture dust extraction - Eurovac high volume/low vacuum systems for stationary equipment with take-offs larger than 2"and high vacuum/low volume systems to offset friction losses with small diameter hoses (1" to 2" vacuum hoses) High vacuum/low volume system for removing dust from hand tools like orbital and belt sanders, grinders, routers and a variety of saws including trim saws, hole saws, skil saws, radial saws and chop saws. www.eurovac.com

Dust Collectors - Dust Control Booth



- Alternative to central high velocity vacuum systems
- Cartridge filtration with air pulse
- Line with sound absorbent mats

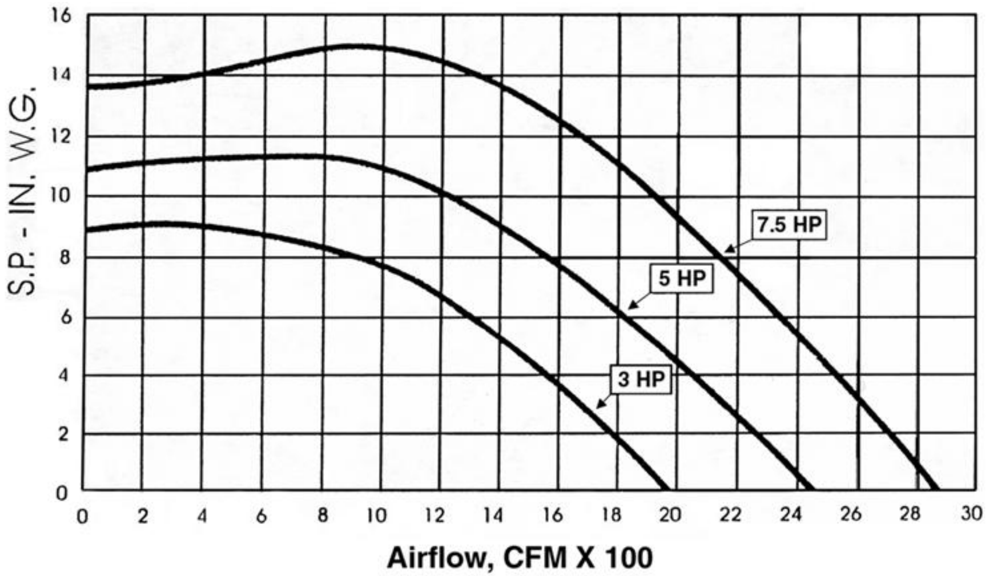
Dust Collectors

Air Cleaner ceiling suspended

- Pulse jets of clean air dislodge particles from the filter cartridge.
- Complete, free-hanging system for continuous collection, cleaning and recirculation of air
- Unique air flow path maximizes collection efficiency and filter life
- Up to 2,650 CFM capacity for high-volume applications

Airflow – Two Stage

Airflow Performance Curves



Airflow Performance Chart

7 ½ HP Cyclone	Air Delivery CFM	Inlet Velocity (FPM)	External Static Pressure (Inches W.G.)
10” Inlet	3500	6450	4.40”
12” Outlet	3000	5460	7.40”
	2460	4510	10.25”
	1950	3580	13.45”

Airflow - Single Stage

Woodtek Operational Capabilities as listed in literature

Model No.	Motor	Voltages	Max CFM @ 0 Static Pressure	Max Static Pressure in Water (UVFR*)	DBA@ 10 ft	Filter Area SQ FT
911-047	¾ HP	120 V	Not provided by mfg.	1” @ 250 CFM	Not provided by mfg.	Not provided by mfg.
864-367	1 HP Portable	110 V	Not provided by mfg.	2” @ 380 CFM 3.2” @ 275 CFM 3.9” @ 200 CFM 4.2” @ 150 CFM 4.4” @ 75 CFM	Not provided by mfg.	Not provided by mfg.
802-124	1 HP	110 V	Not provided by mfg.	2” @ 400 CFM 2.7” @ 375 CFM 3.4” @ 300 CFM 3.9” @ 200 CFM 4.1” @ 120 CFM 4.2” @ 75 CFM	Not provided by mfg.	Not provided by mfg.
805-930	2 HP	230 V	Not provided by mfg.	3.6” @ 790 CFM 4.2” @ 770 CFM 6.9” @ 550 CFM 8.0” @ 420 CFM 8.5” @ 300 CFM	Not provided by mfg.	Not provided by mfg.
864-381	3 HP	230 V	Not provided by mfg.	4” @ 1180 CFM 5.6” @ 1050 CFM 8.0” @ 890 CFM 8.8” @ 780 CFM 9.2” @ 300 CFM	Not provided by mfg.	Not provided by mfg.

* UVFR – Woodtek term – Useful Volume Flow Rate - CFM

Airflow - Single Stage

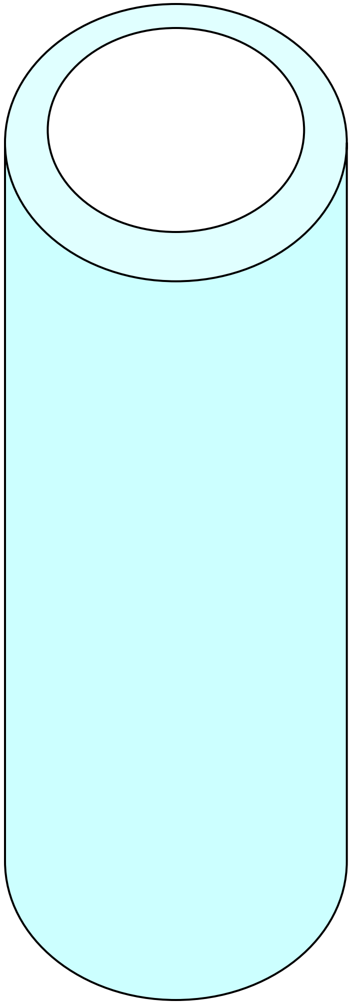
Dustek Operational Capabilities as listed in literature

Model	300	500	750	1000
Motor HP	3	5	7-1/2	10
Speed RPM	3450	3450	3450	3450
Collection Capacity Ft.	15	30	45	45
Filter Area Sq. ft.	25	50	75	100

Fan Inlet Pressure (I.W.G.) vs. Air Flow Rate (CFM)												
Model	300 CFM	400 CFM	500 CFM	750 CFM	1000 CFM	1250 CFM	1500 CFM	2000 CFM	2500 CFM	3000 CFM	3500 CFM	4000 CFM
300	9.1	9.1	8.9	7.2	3.5							
500			11.4	11.2	10.2	8.7	6.5	.4				
750			8.6	8.5	8.4	8	7.6	7.1	6.6	6		
1000	10					9.8	9.6	9.0	8.4	7.6	6.8	4.7
•Information based on clean filter bags												

Cartridge Filters

- Durable
- Fine dust filtration, high efficiency
- Smaller housings required for collectors
- Optimum discharge of dust cake
- Fabric elements, paper elements (various media)
- Pulse cleaning, outer screen is utilized to provide extra support without restricting air flow or interfering with dust discharge
- Alot of filter surface area in confined space (pleated style)
- Easy, fast replacement



Filter Media

Construction	Medias	Plain	Glazed	Acrylic	Flame Retardant	Teflon	Singed	Silicone
Needled Felts	Polyester	*	*	*	*	*	*	*
	Polypropylene	*	*			*	*	*
	Wool	*			*		*	
	Nylon	*			*		*	
	Orlon	*			*		*	
	Teflon	*						*
	Nomex	*				*	*	
	Ryton	*				*	*	
	P-84	*				*	*	
Woven Material	Cotton	*			*			
	Glass	*				*		*
	Nylon	*			*			
	Polyester	*			*	*		*
	Polypropylene	*						

- **Plain** – Natural Finish
- **Glazed –** Glazing accomplished by running media over hot roller which melts fibers and results in a “skin smooth” finish
- **Acrylic –** coated polyester for moist environments
- **Flame Retardant** – Not flame proof, but provides a self-extinguishing feature that is used when sparks are involved, such as grinding process
- **Teflon** – Expansive membrane coating that provides an extremely smooth finish
- **Singed** – Singing accomplished by running media over top of open flame to burn off any loose fibers that accumulated on felt during production of media
- **Silicone** – Very good smooth coating.

System Design

Duct Velocity Use this chart to determine the Velocity of your system

Recommended Minimum Dust Velocities		
Metalworking dusts	4500 FPM branches	4000 FPM mains
Woodworking & other light dusts	4000 FPM branches	3500 FPM mains

Conveying Velocities	
Materials Conveyed	Conveying Velocity in Ducts-FPM
Vapors, fumes, very fine dusts	1500-2000
Fine dry dust	3000-3500
Average industrial dusts	3500-4000
Coarse particles	3500-4500
Large, heavy loads, moist materials	4500 & higher

Chart 1			
CFM Requirements for diameter at specified velocity			
Dia.	3500 FPM	4000 FPM	4500 FPM
3”	170	195	220
4”	300	350	390
5”	475	550	610
6”	700	785	880
7”	950	1100	1200
8”	1200	1400	1570
9”	1550	1800	1990
10”	1900	2200	2450
12”	2800	3175	3600
14”	3800	4300	4800

Chart 2					
Static Pressure based on 100’ of Pipe				Elbow to Straight Pipe Conversion	
Dia.	3500 FPM	4000 FPM	4500 FPM	90^{O} Elbow 1.5 Dia. Rad.	45^{O} Elbow 1.5 Dia. Rad.
3”	7.5	10.0	12.0	5’	2.5’
4”	5.5	7.0	8.5	6’	3’
5”	4.2	5.5	6.5	9’	4.5’
6”	3.5	4.5	5.5	12’	6’
7”	2.8	3.8	4.5	13’	6.5’
8”	2.4	3.2	3.8	15’	7.5’
9”	2.0	2.8	3.4	17.5’	8.75’
10”	1.8	2.4	3.0	20’	10’
12”	1.5	2.0	2.5	25’	12.5’
14”	1.3	1.6	2.0	30’	15’

System Design (continued)

Example:
CFM and Resistance for CNC Router with 8" outlet collar to dedicated dust collector 20 feet away.

CFM Required for 8" diameter at 4,500 FPM velocity = 1,570

<u>Duct Run Resistance</u>
Entry Loss = 2" S.P.W.G.
Filter Loss = 2" S.P.W.G.
8" Diameter Duct Run

2, 45 degree Elbows =	15' straight pipe
1, 90 degree Elbow =	15' straight pipe
Straight Pipe =	20'
15' Flex Hose =	45' straight pipe
Total straight pipe after conversions =	95'

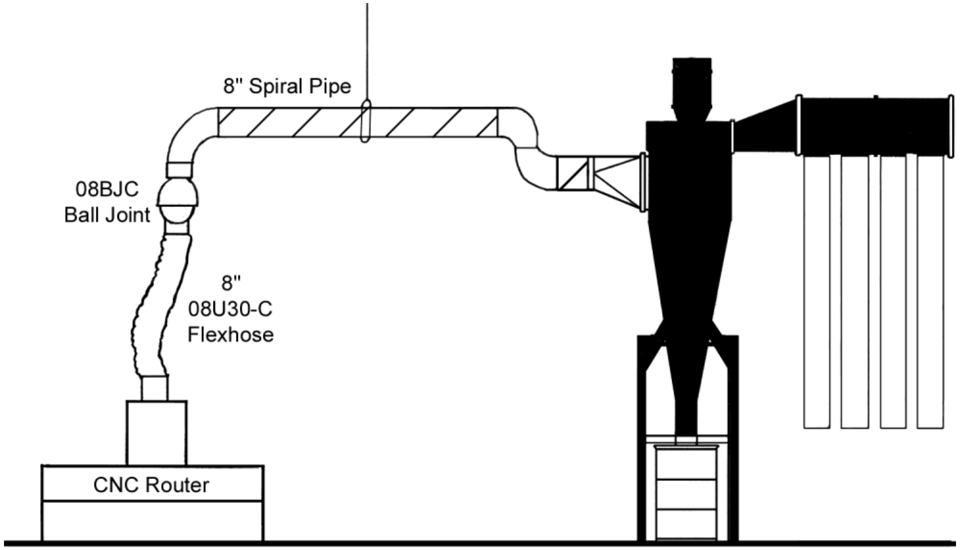
Static Pressure for 1,570 CFM in 8" duct at 4,500 FPM = 3.8" per 100'

3.8" x 95' (.95) =	3.61 S.P.W.G.
S.P. for 08BJC =	.25 S.P.W.G.
2"+2"+3.8"+.25" =	**8.05 S.P.W.G.**

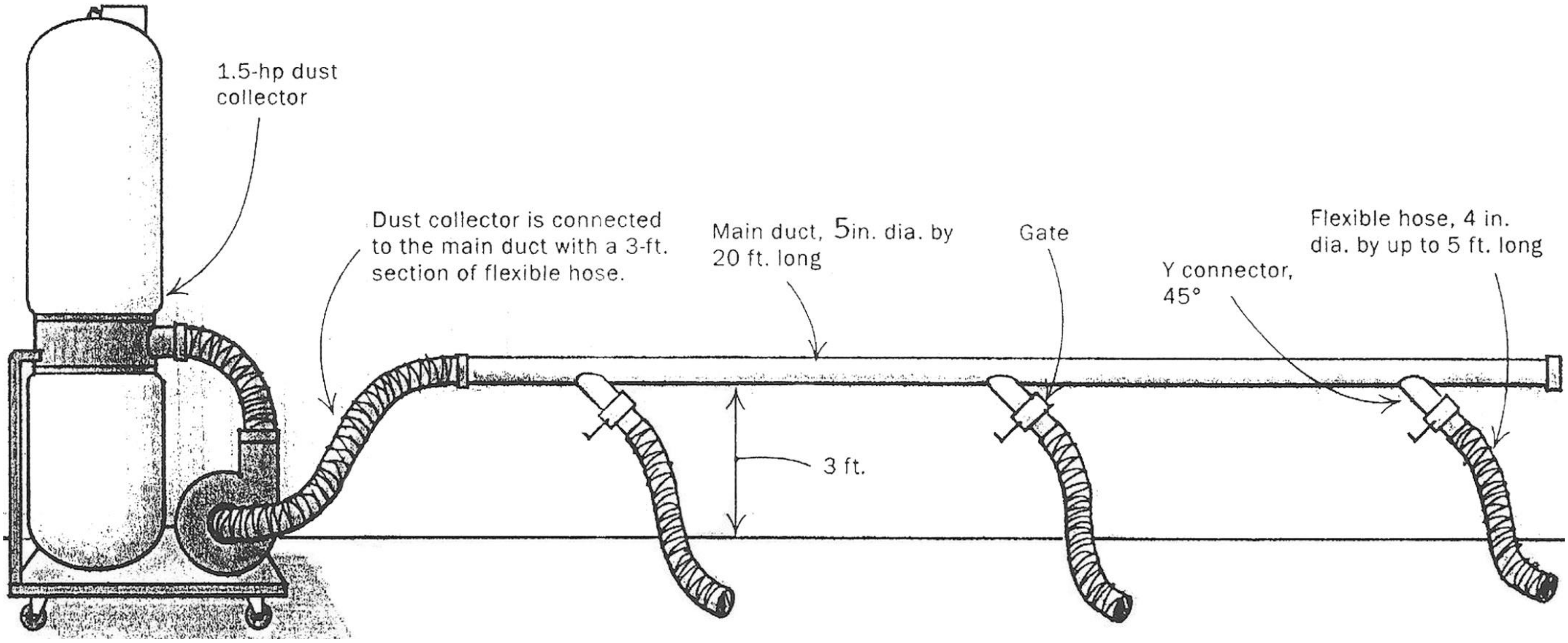
Requirement for Dust Collector =

1,570 CFM at 8.05" S.P.W.G.

S.P.W.G. = Static Pressure Water Gauge

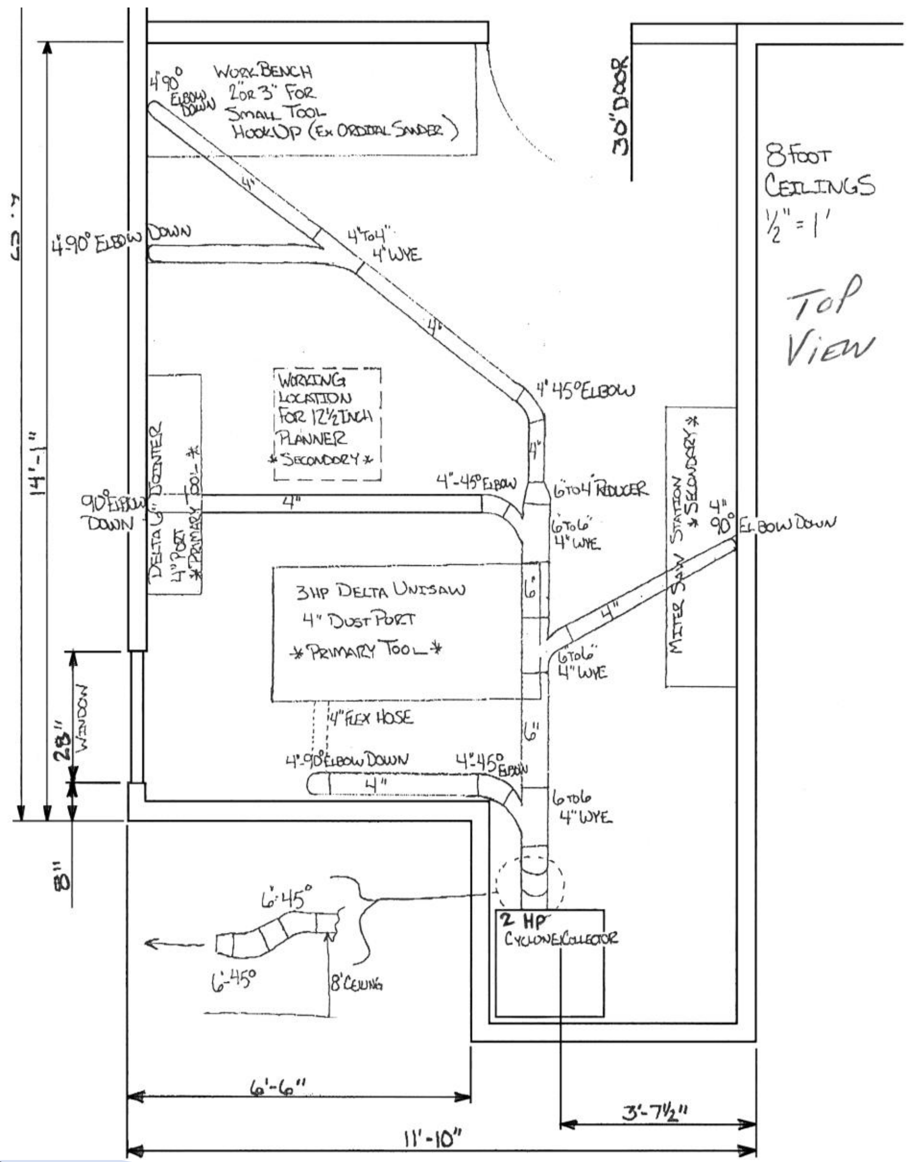


Design Information – 1.5 HP Dust Collector

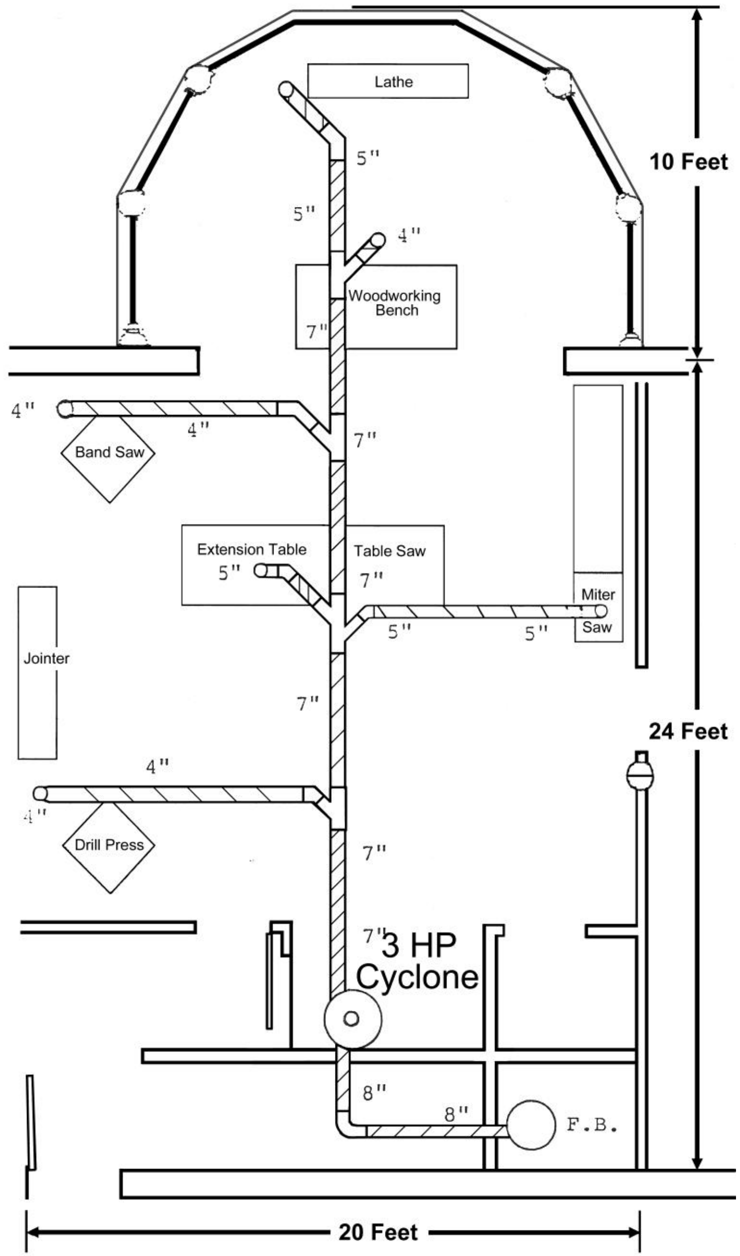


Source: Fine Woodworking

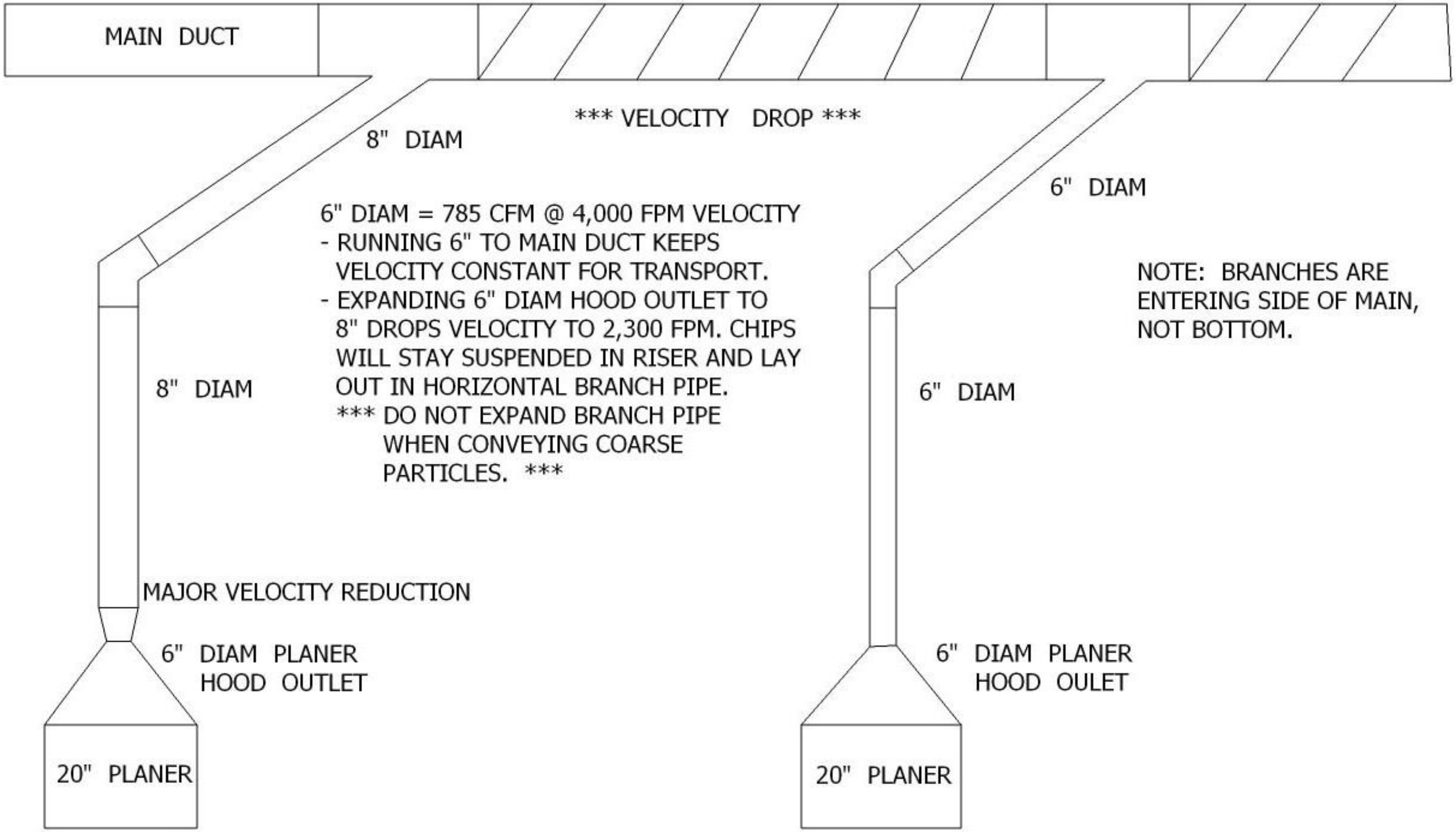
Design Information – 2 HP Dust Collector



Design Information – 3 HP Dust Collector



Design Information - Velocity Drop



Products in Action

Jamaica Deaf Village

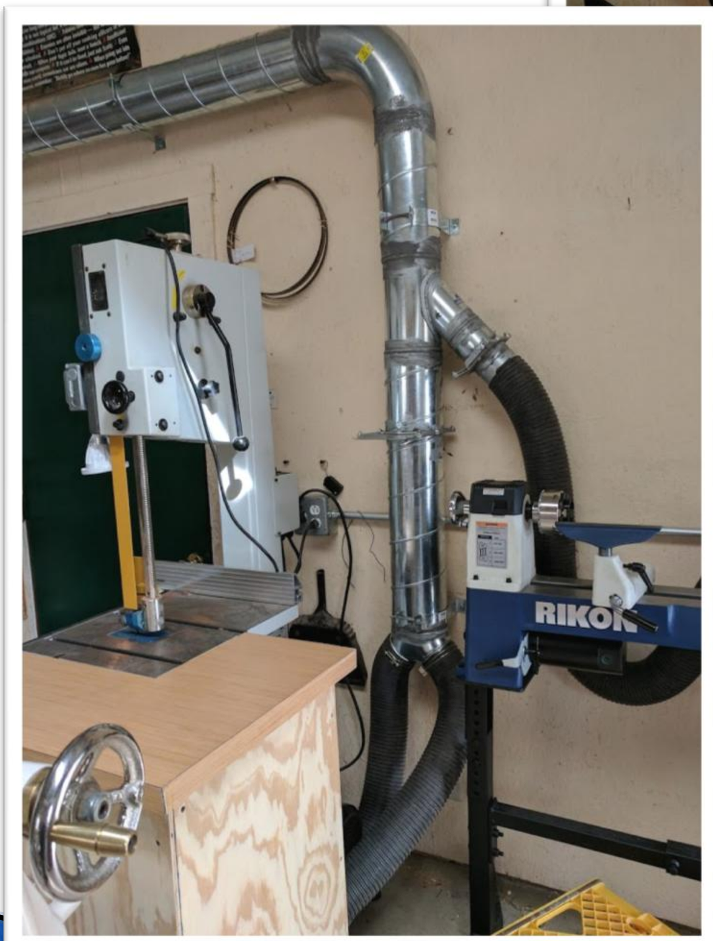
Kris Kraft Cabinet, Yuma, AZ

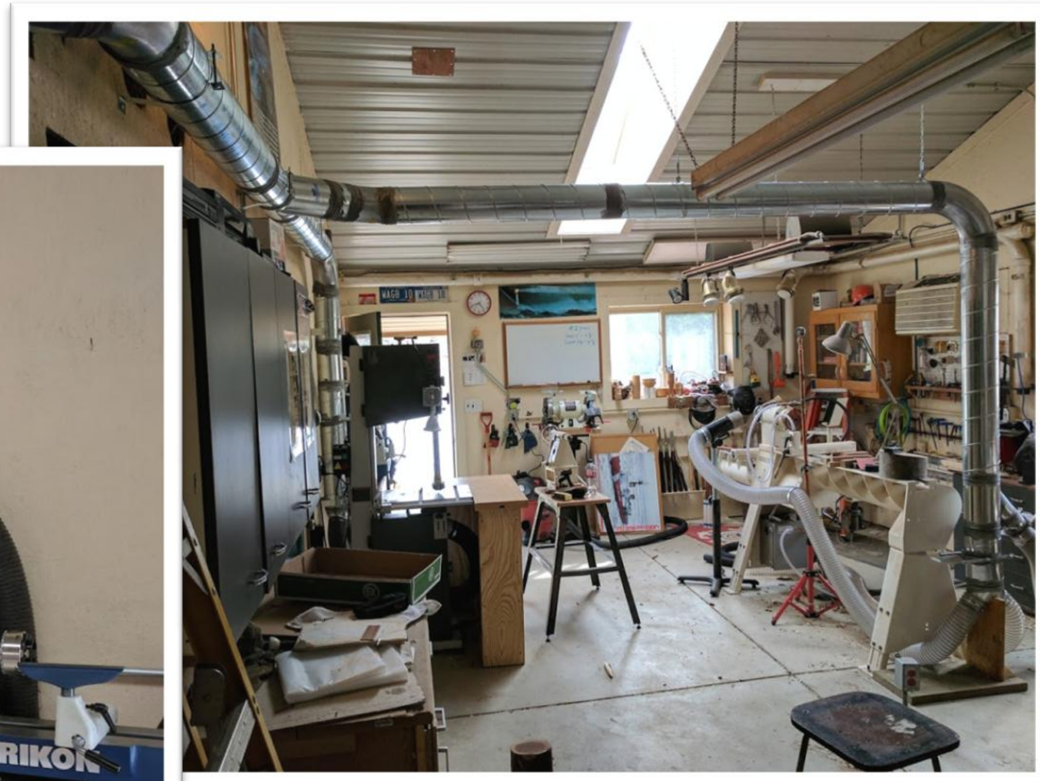
Products in Action

Yancey, Shingle Springs, CA

Thommen, Bethel, CT

Products in Action





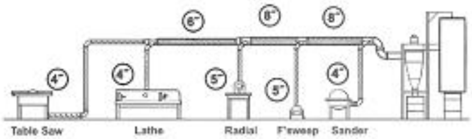
White Heath Bowls, Manchester, MI

Designing Your Air Handling Dust System

In addition to using the following instructions, we recommend reading the "Woodshop Dust Control Book", by professional woodworker Sandor Nagyszalanczy. Sandor gives you practical, shop-tested solutions to total dust control so you can build the right system for your shop-without complex calculations.
Part #: TPBWDC. SOFTCOVER, 192 PAGES, To order call us at (800) 367-3828

The first step in designing your system is to draw a floor plan of your shop area including the following:

1. *Location of dust producing machines: indicate size & location of dust pick-ups on each machine.*
2. *Desired location of dust collector unit.*
3. *Floor to joist measurement.*
4. *Any obstructions that would interfere with the run of the duct.*



You should also familiarize yourself with these terms:

CFM - Air Volume in cubic feet per minute.

FPM - Velocity of Air in feet per minute.

SP - Static Pressure. This is expressed in inches water gauge. It is resistance to air at rest in a duct, and is also commonly called "resistance," friction," "friction loss'" or "pressure loss."

VP - Velocity Pressure: expressed in inches water gauge. It is kinetic pressure in the direction of flow necessary to cause air at rest to flow at a given velocity.

It is best to do the following calculations **BEFORE** you purchase your Dust Collector or the necessary ductwork.

A) Duct Velocity (FPM); B) Determine Diameter of each Branch; C) Determine Diameter of Main Duct; D) System Resistance (SP)

A) Duct Velocity. **(Use the chart below to determine the Velocity of your system.)**

Type of Dust	Velocity in Branches	Velocity in Main
Metalworking Dust	4500 FPM	4000 FPM
Woodworking Dust	4000 FPM	3500 FPM
Other Light Dust	4000 FPM	3500 FPM

B) Determine Diameter of each Branch. There are several ways to determine the diameter of the branches.

1. *If the machine has a factory installed collar, the manufacturer has determined that the machine needs that size branch under normal circumstances.*
2. *If the machine has a metric diameter outlet, convert it into inches, and round off to the nearest inch. When writing up your parts list you may need to order a custom reducer.*
3. *If the outlet is rectangular you need to determine the equivalent round diameter. When you write up your parts list use a rectangular-to-round transition.*
4. *If the branch is smaller than 3" diameter plan using a reducer near the machinery to increase the branch to 3". Figure the CFM for 3" (195 CFM).*

Determine CFM requirements for each branch. Under the proper velocity note the CFM of each branch. If working with wood dust, use 4000 FPM in branches (see Chart 1).

C) Determine Diameter of Main Duct.

1. Determine which machines are your primary machines. A primary machine is the machine(s) that will operate at the same time under the worst conditions. (If you normally operate two machines, but once a week need to operate a third machine at the same time, then you must size your system for all three machines.) It is recommended that you highlight the primary machines on the drawing.
2. Sizing the Main Trunk Line. When sizing the main trunk line start with the primary machine farthest from the dust collector. Run that size duct until the next primary branch enters the main. Increase the main size at that junction to accommodate the C.F.M. total of the two primaries. You will follow this practice all the way to the collector, sizing all primary junctions to accommodate total C.F.M. of all primaries at that point. Do not increase main duct size when a branch other than a primary enters. Your total C.F.M. requirement is the total of all primary branches. When not using a primary machine you will close blastgate and divert suction to a secondary machine.

Example: You have 3 primary machines. You have already assigned the branch diameter and CFM requirements.

Table Saw, Lathe	**4" Diameter**	**350 CFM**
Radial Saw	**5" Diameter**	**550 CFM**

A 4" branch will be run from the Table Saw until it joins with the 4" branch from the Lathe. At this point your main starts and you need to increase the pipe to handle the combined CFM (350+350 = 700). Using the CFM Chart 1 look up 700 CFM under the appropriate velocity (3500 in the main for wood dust), then look at the corresponding diameter (6"). You will run 6" pipe in the main from the Lathe until the branch of the Radial Saw joins the main.

Here again you need to increase your main to handle the total CFM (700+550=1250 CFM). Using the chart again you will see that 1250 CFM is slightly more than volume for 8" diameter. Drop back to 8" diameter so as not to go below transport velocity. Run the 8" duct in your main from the Radial Saw to your Dust Collector.

If you are installing an indoor recirculating dust collector you need not calculate any more duct diameters. If you are attaching ductwork to the exhaust side of your dust collector it is accepted practice to use a duct diameter two inches larger on the exhaust side than on the inlet side, thus minimizing exhaust and duct resistance.

Static pressure of two 4" branches (350 CFM each) and one 5" branch (550 CFM) pulling vacuum simultaneously. (Total 1,250CFM)

Chart 1			
CFM requirements for diameter at specified velocity.			
Dia.	**3500 FPM**	**4000 FPM**	**4500 FPM**
3"	170	195	220
4"	300	350	390
5"	475	550	610
6"	700	785	880
7"	950	1100	1200
8"	1200	1400	1570
9"	1550	1800	1990
10"	1900	2200	2450
12"	2800	3175	3600
14"	3800	4300	4800

Chart 2					
Static Pressure based on 100' of Pipe.				Elbow to Straight Pipe Conversion.	
Dia.	**3500 FPM**	**4000 FPM**	**4500 FPM**	**90 Elbow 1.5 Dia. Rad.**	**45 Elbow 1.5 Dia. Rad.**
3"	7.5	10.0	12.0	5'	2.5'
4"	5.5	7.0	8.5	6'	3'
5"	4.2	5.5	6.5	9'	4.5'
6"	3.5	4.5	5.5	12'	6'
7"	2.8	3.8	4.5	13'	6.5'
8"	2.4	3.2	3.8	15'	7.5'
9"	2.0	2.8	3.4	17.5'	8.75'
10"	1.8	2.4	3.0	20'	10'
12"	1.5	2.0	2.5	25'	12.5'
14"	1.3	1.6	2.0	30'	15'

D) Figure System Resistance (SP) The total static pressure is several factors added together. They are entry loss, dirty filter loss, static pressure of the worst branch duct, static pressure of main duct, and static pressure of the return duct.

1. There are more complicated ways to figure the entry loss of your system, but we find it usually equals a loss of **1"** watergauge. (Use 1" as a constant).
2. If your system has filters, add in a **2"** loss. (If you do not have filters add zero).
3. The Worst Branch, is the branch with the greatest resistance. The branch with the greatest resistance is usually a smaller diameter with the most lineal footage of pipe and elbows. Static pressure of worst branch and main duct can be calculated by using Chart 2. Chart 2 is based on 100 feet of pipe; therefore, you have to convert all elbows to an equivalent of pipe. To convert 90 and 45 degree elbows to equivalent feet of pipe use this chart. When figuring the feet of pipe, count lateral type branches as 45 degree elbows. Flexhose has a lot of resistance depending on the corrugation. For this reason it is suggested that you keep hose to a minimum. Multiply your length of flexhose on your worst branch by 3 for equivalent length of straight pipe.

***Example*: Determine Static Pressure in Worst Branch**

Static Pressure (Inches of Water Gauge) in WORST BRANCH (4" Table Saw).

Description - 4" Diameter	**Equivalent to Straight Pipe**
Straight Pipe	20'
2 - 90° Elbows	12'
1 - 45° Elbows	6'
5' Flexhose (3x)	15'
Total equivalent straight pipe after conversions	**53'**

350 CFM in 4" diameter = 7" S.P. per 100'
350 CFM in 4" diameter = **3.71"** S.P. per 53'

***Example:* Static Pressure in MAIN DUCT 6" and 8"**

The static pressure of the Main Duct is done the same way, except you figure it out for each diameter in the Main, starting farthest away and working toward the collector.

Description - 6" Diameter	**Equivalent to Straight Pipe**
Straight Pipe	20'
Total equivalent straight pipe after conversions	**20'**

700 CFM in 6" diameter = 3.5" S.P. per 100'
700 CFM in 6" diameter = **.70"** S.P. per 20'

Description - 8" Diameter	**Equivalent to Straight Pipe**
Straight Pipe	25'
2 - 90° Elbows	30'
Total equivalent straight pipe after conversions	**55'**

1,250 CFM in 8" diameter = 2.4" S.P. per 100'
1,250 CFM in 8" diameter = **1.3"** S.P. per 55'
(8" Diameter runs to self contained Dust Collector)

Total Static Pressure 1" + 2" + 3.71" + .70" + 1.3" = 8.71" S.P. Water Gauge!
System Requirement - 1,250 CFM at 8.71" SPWG

4. If clean air return duct is required, duct resistance should also be calculated.

Now you have all the information you need to make an educated decision in purchasing your dust collector. You have determined the Velocity, CFM, Static Pressure and the size of the ductwork. To develop your list of materials required, go through the system; this time starting at the dust collector and list each part you will need. Don't forget the assembly equipment such as: pop rivets, hangers, strapping, caulking, and couplings. **For ordering please Call: (800) 367-3828; Fax: (800) 438-7135; or Mail: (Air Handling Systems, 5 Lunar Drive Woodbridge, CT 06525)** us your parts list. If you have any questions while you are designing your system give us a call and we'll be happy to help.

Installation of Spiral Pipe and Fittings

1. Fittings and Small-End couplings are male sized to slip inside pipe and flexhose.
2. Fitting-to-Fitting connections are made by using a Large-End coupling or a short length of spiral pipe.
3. Our duct work is not flared or belled on one end for the "air flow" type of joint.

Continued on next page

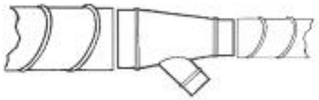
Installation of Spiral Pipe and Fittings *Continued*

Round duct sections of spiral pipe are connected together by small end coupling (part no. COUP). The coupling as a male part, is slipped into the duct.

Pipe to Pipe Connection, slip coupling for joining pipe.

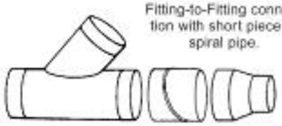
All fittings, unless specially ordered, are sized as a male part. A fitting-to-duct connection is made by slipping the fitting into the duct.

Fitting-to-Duct Connection

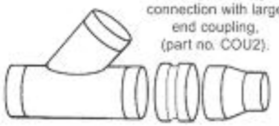


Fitting-to-fitting connections can be made two ways: by cutting, a short length of spiral pipe approximately four inches or longer and using this length of pipe as a female connection; or by using a Large-End Coupling (part no. COU2) which is four inches long.

Fitting-to-Fitting connection with short piece of spiral pipe.



Fitting-to-Fitting connection with large end coupling, (part no. COU2).



Dust Collection Q&A

Why should I buy dust collection?

One important reason is to avoid the health risk. Inhaling fine dust can develop into respiratory illnesses as well as aggravate existing respiratory conditions. There are various types of dust that can also cause irritation to uncovered skin surface. Fine dust can stay suspended for hours. Exposing employees to this type of environment will certainly result in workman's compensation claims or even possibly a law suit. Providing dust collection at machinery as well as self-contained ceiling suspended dust collection units will keep the shop air virtually dust free.

To produce a quality product, the workshop should be as dust free as possible. If you have ever driven in a snowstorm or rainstorm you can feel for a woodworker who has his vision impaired by clouds of sawdust. Making accurate cuts, measurements, assemblies, etc. are extremely difficult under this condition. Also, if a shop has a high concentration of dust in the air, the dust can be drawn into paint booths. The dust will surely create a defective finish on the product. In addition, if dust collection is not provided for machines such as planers, the chips will lay on the boards and create indentations on the planed material. Thus, again creating a defective product. Having spot dust collection on machinery and self-contained air cleaners will surely take care of these potential problems.

Metal and Fumes in the Dust Collection System – I sometimes bore holes into iron at my drill press. It is safe to admit these metal filings and chips into a vacuum drop? Also, can the system be used to remove low-level solvent fumes from the shop?

When setting up an air-handling system, you have to be careful to make sure that whatever it will be handling is compatible.

In general, I don't recommended the mixing of unlike material in an exhaust system because it might start a fire or cause an explosion. Mixing wood with metal chips or filings, especially ones that are very hot from drilling, has the potential to create a spark, and more. When a spark comes in contact with finely divided dust particles or solvent fumes, the spark can cause the two materials to ignite.

Because solvent fumes can contain flammable vapors and often have an explosive nature, they shouldn't be mixed in the average dust-collection system. Volatile fumes, like those from solvents, thinners or lacquers are highly flammable. They have to be handled by a blower that is constructed of non-ferrous metals (usually aluminum) and is explosion proof.
Improperly used, a dust-collection system can defeat the purpose of using it in the first place. Always consult with an Air Handling System's specialist or the National Fire Protection Association (800-344-3555) before mixing materials in an exhaust system.

How does one go about grounding a (PVC) plastic pipe system?

I am not sure your typical plastic pipe system conveying dust can be adequately grounded. As we know, the reason for people attempting to ground pipe is because of the generation of static electricity. Static electricity develops when the dust particles constantly rub the plastic surface. A substantial electrical accumulation may result, which then begins to discharge into fine dust particles. It is likely an explosion will occur at some time under this condition. Interior and exterior grounding has to be considered. If a grounding method was available for this situation, I am sure it would be quite extensive and expensive.
Plastic pipe systems are not designed for dust collection use. A necessary diversity of fittings to meet design requirement does not exist. Also, plastic pipe elbows have a very short radius and plastic tee fittings are improper for dust removal. It is these types of problems that lead to an inefficient dust collection system.

My suggestion would be to convert over to a metal piping system. With a metal dust collection piping system you do not have the concern of static electricity developing. Elbows and other various fittings are properly designed for conveying dust. The diversity of fittings and accessories will enable you to meet design requirements. Inevitably, you will get the best performance from your dust collector.

What is the difference between a single stage and two-stage collector?

Since most woodworking dust contains coarse and fine sized particles, a two-stage dust collection system is generally recommended. A two-stage dust collector consists of a first stage cyclone, a blower and a second stage after filter.

A cyclone separator is a cone shaped vessel into which the dust-laden air enters. The dust particles' inertia causes them to move toward the separators outer wall. As the dust particles proceed towards the outer wall the coarse-sized particles lose momentum. When the velocity drops on the coarse-sized particles, gravity causes them to settle into the container below. The remaining fine dust exits through a central outlet at the top and into the blower. The blower than relays the fine dust to the after filter. It is important to know that the longer the cyclone body and cone, the better the dust separation.

One major reason for using a separator is so the blower unit will only convey fine dust. In a single stage unit, coarse wood dust particles and other debris hitting the blower impeller most likely will result in blower unbalance. The condition will ruin the blower quickly. Also, a separator is used so that the after filter does not receive 100% of the dust-laden air.

Is it a good idea to locate my collector outside my shop?

Yes, it is a good idea to locate your collector in an enclosure on an outside wall of the shop. A couple of benefits are: saving floor space, and most of the noise will be contained in the enclosure. One important factor is that you cut in a filter frame near the ceiling, on the common wall between the enclosure and the shop, and insert a furnace filter. A 20"x20" filter is normally adequate. This will allow air to re-circulate back into the shop. The furnace filter is inexpensive to change and will provide for cleaner air returning to the shop.

I'm a small shop and I need just a few items. Will you sell direct to me?

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For additional design information or answers to your dust collection questions contact:

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(800) FOR-DUCT (367-3828) Fax: (800) 438-7135
www.airhand.com e-mail:sales@airhand.com

Additional Resources

See attached documents

- White pages
  - How much CFM will my dust collector deliver
  - What is Static Pressure
  - Innovation or Gimmick
  - Be sure to check inlet collar ID and OD
  - Fitting Tip
  - Two-stage dust collector
  - Biggest wood dust collection problem…

Sources

ACGIH - American Conference of Governmental Industrial Hygienists, Inc.

1330 Kemper Meadow Dr., Suite 600, Cincinnati, OH 45240-1634

(513) 742-2020

www.acgih.org

"Industrial Ventilation – A Manual of Recommended Practice"

NFPA – National Fire Protection Association

One Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101

(617) 770-3000

www.nfpa.org

NFPA 664 "Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities"

SMACNA – Sheet Metal and Air Conditioning Contractor's National Assoc., Inc.

4201 Lafayette Center Drive, Chantilly, VA 20151-1209

(703) 803-2980

www.smacna.org

"Round Industrial Duct Construction Standards"

Thank you

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