WE29
Classroom Tool Safety
A Participatory Session, Teacher Track
Dust Collection

Presented by
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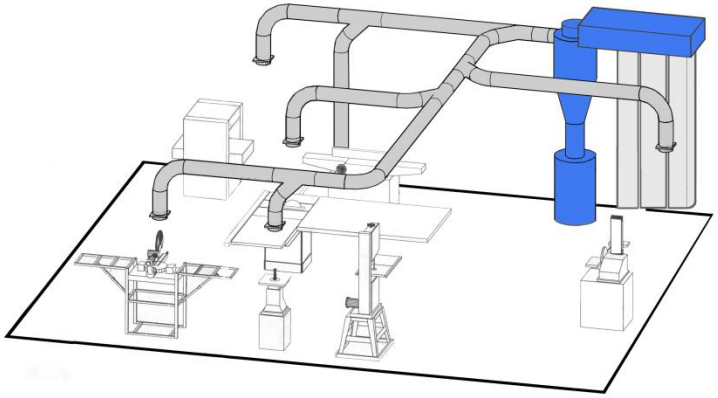
The Proper THREE (3) are the key for Successful Dust Control!

1. Piping for a Central Dust Collection System.



2. Hooding

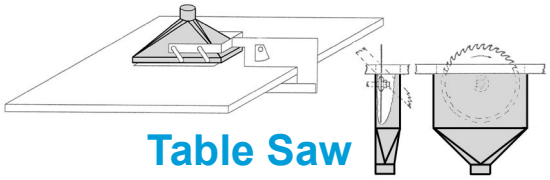
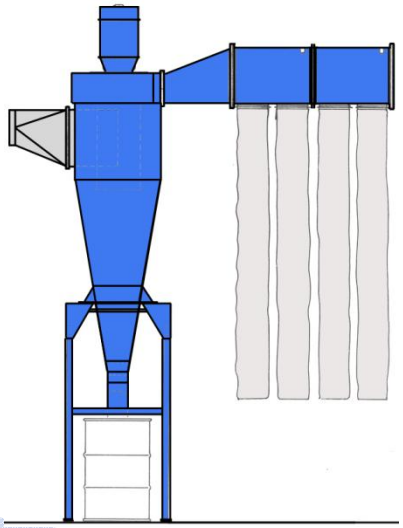


Table Saw

3. Dust Collectors



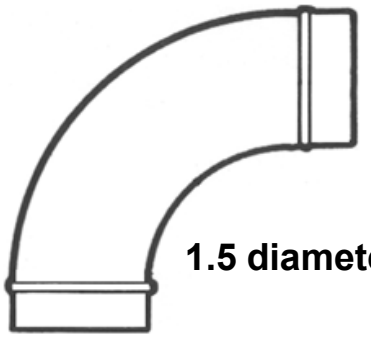
Piping – Galvanized Spiral Pipe

- 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

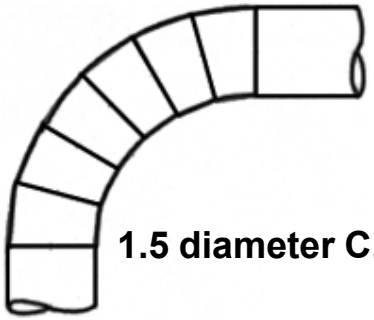
Diameter	0”-10” W.G.	10”-20” W.G.
3”-7”	26 Ga.	26 Ga.
8”	26 Ga.	26 Ga.
9”-12”	24 Ga.	24 Ga.
13”-15”	24 Ga.	22 Ga.
16”-18”	22 Ga.	20 Ga.
19”-22”	22 Ga.	18 Ga.
24”-26”	20 Ga.	18 Ga.

Piping - Elbows



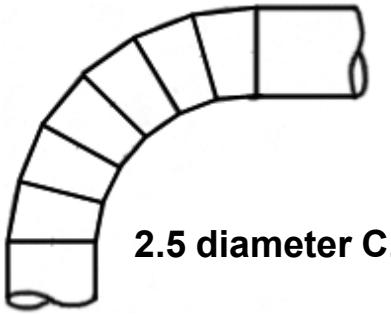
1.5 diameter C.L.R.

Die Formed Smooth (PREFERRED)



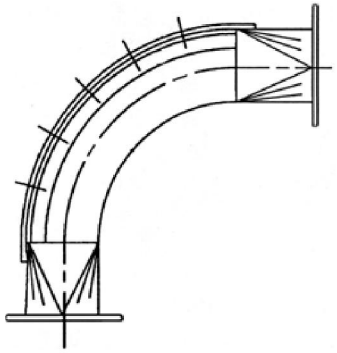
1.5 diameter C.L.R.

Gored (ACCEPTABLE)

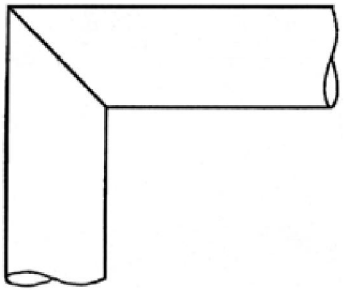


2.5 diameter C.L.R.

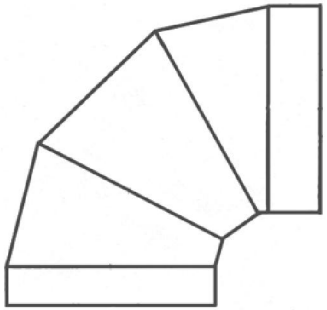
Gored (ACCEPTABLE)



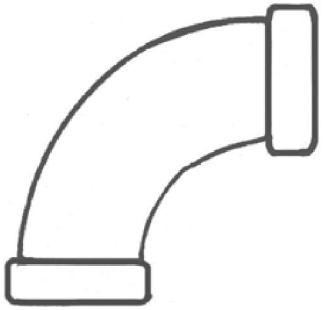
Flat Back (SPECIAL)



Mitered (AVOID)



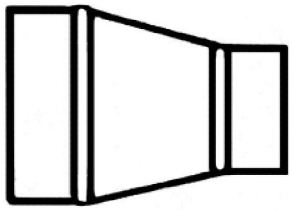
Heating Short Radius (AVOID)



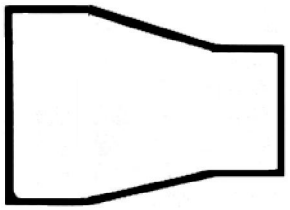
PVC Short Radius (AVOID)

C.L.R. = Center Line Radius

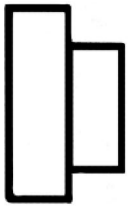
Piping - Reducing Fittings



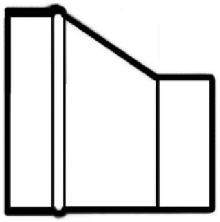
FABRICATED
Tapered Reducer



SPUN
Tapered Reducer

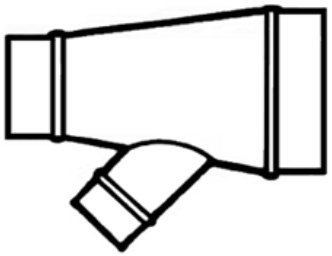


Flat Reducer
(AVOID)

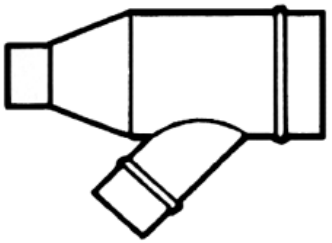


Eccentric Reducer
(AVOID)

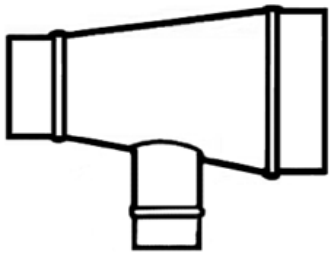
Piping - Junction Fittings



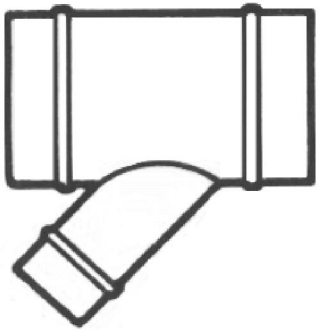
45° Tee on Taper
(PREFERRED)



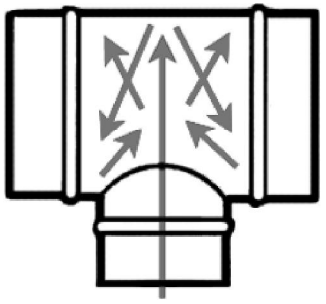
45° Reducing Lateral
(Acceptable)



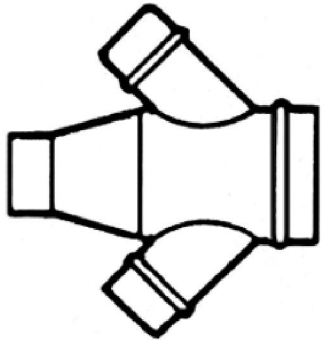
90° Tee on Taper
(AVOID)



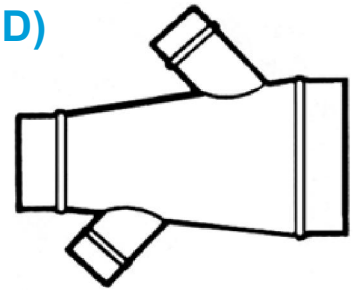
45° Lateral
(PREFERRED)



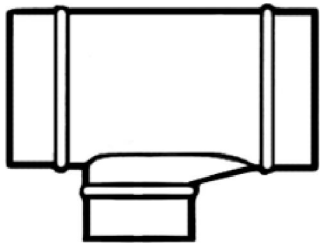
90° Bull Head Tee
(AVOID)



45° Double Cross
Reducing Lateral
(AVOID)

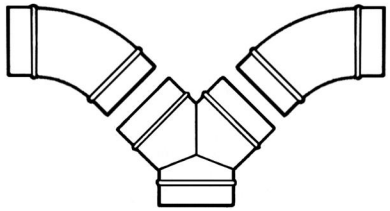


45° Double Cross Tee on
Taper (PREFERRED)

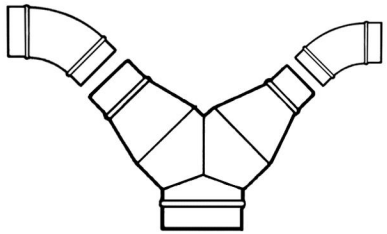


Boot Tee

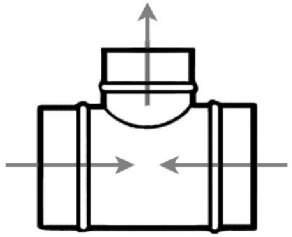
Piping - Junction Fittings



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.

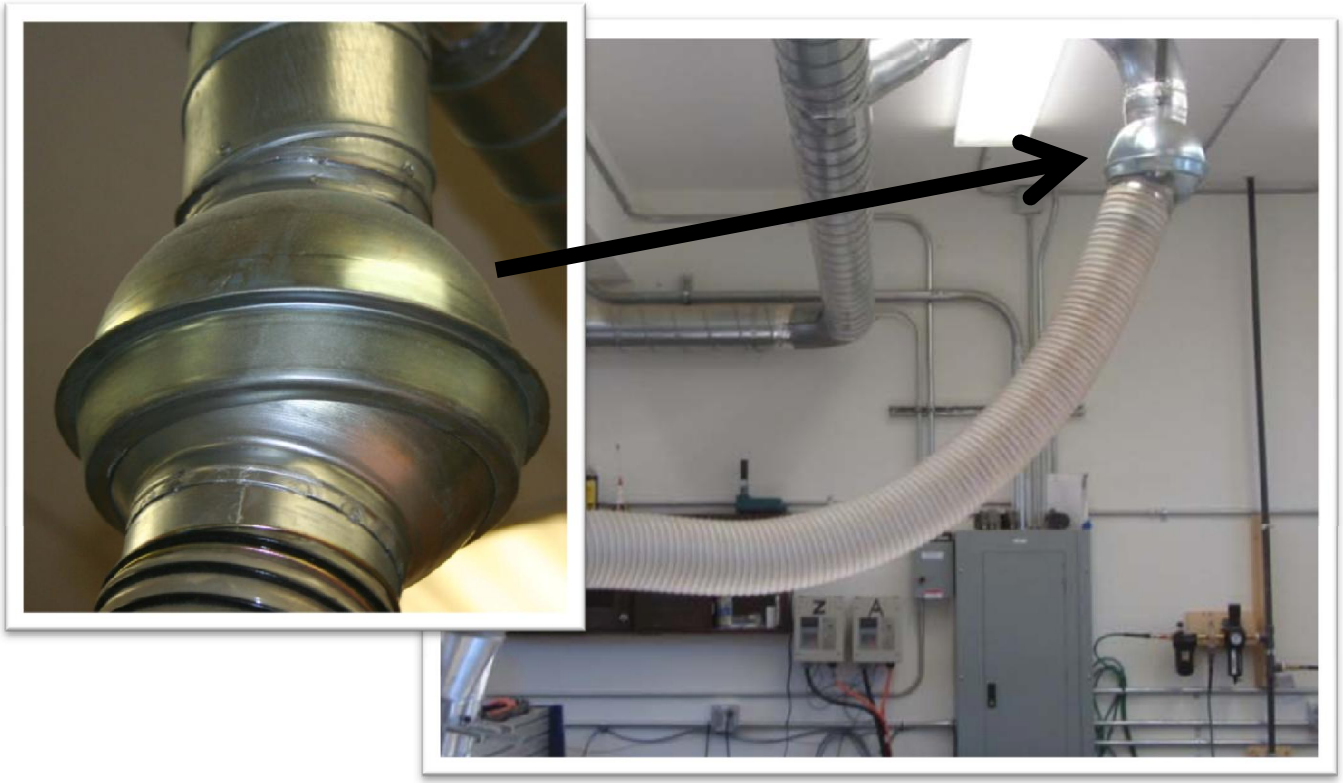
Bellmouth

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

45º Saddle Taps

Ideal for tapping into EXISTING pipe runs.

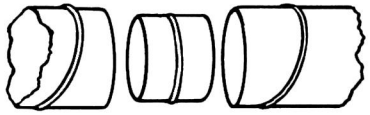
Piping - Ball Joint



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.

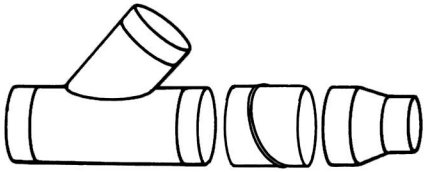
Piping - Connections

Pipe-To-Pipe Connections



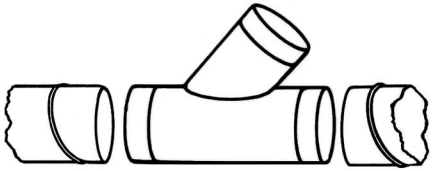
Spiral pipes are connected together by a sleeve type coupling (Part No. COUP). The coupling has a small-end and is slipped into the pipe sections.

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.

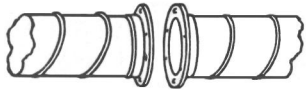
Fitting-To-Pipe Connections



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

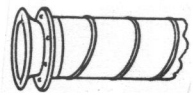
Piping - Connections

Welded Flanges



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

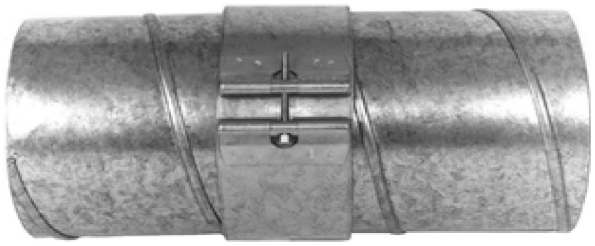
Vanstone Flanges



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.

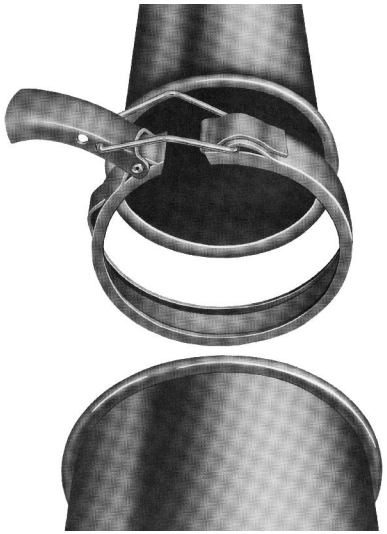
ECS - Easy Connect Sleeve

Draw band style with gasket



Clamp Together

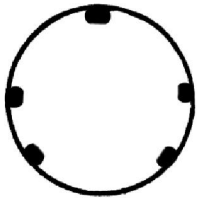
Uses barrel-type clamp



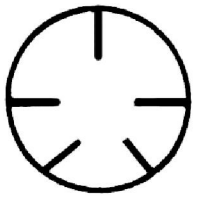
Piping - Airtight

- 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

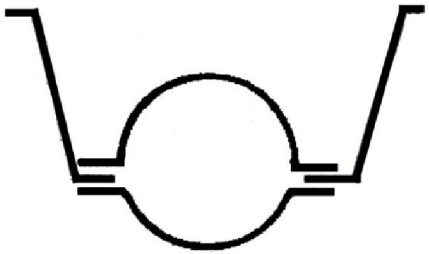


Pop Rivets



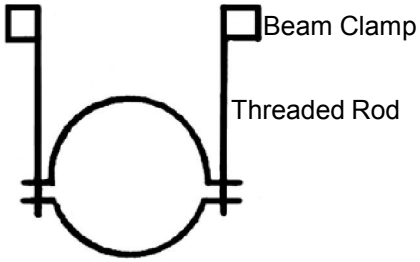
Screws

Piping - Hangers



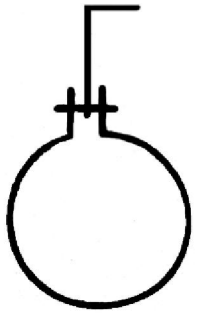
Heavy Duty Hanger
with Strap
Angle Strap out away from pipe on approx. 15 degree angle. This will prevent sway.

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.

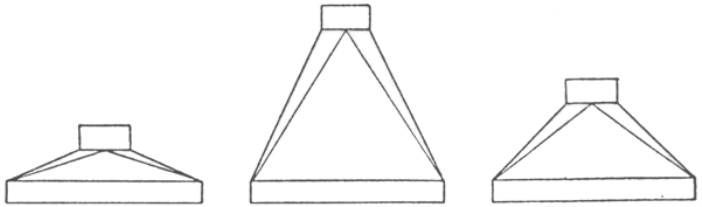
Three important factors when designing a hood.

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.

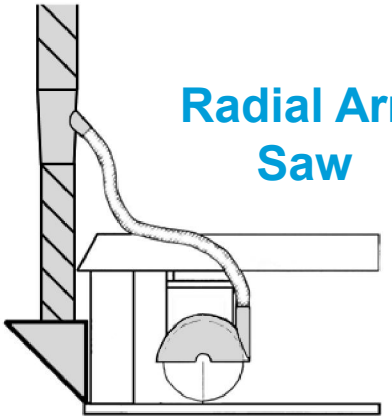
Lengths of Hoods



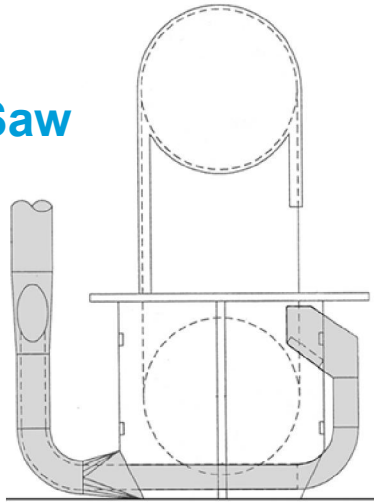
Too Short Too Long Proper Length

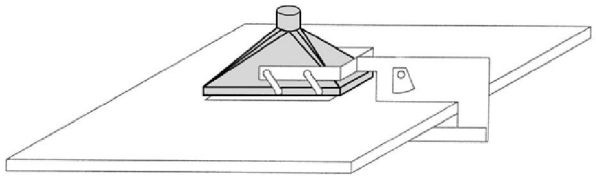
Hooding Examples

Radial Arm Saw



Band Saw





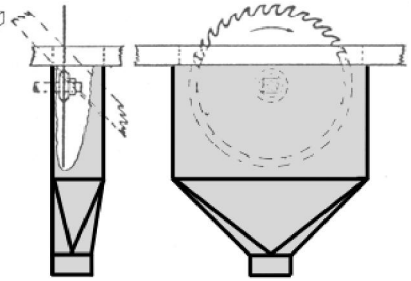
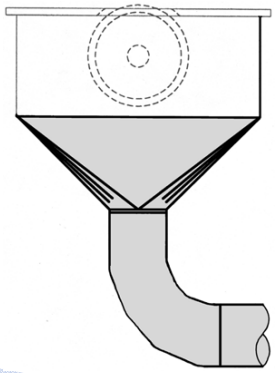


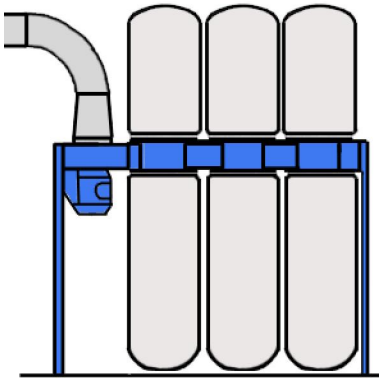
Table Saw

Single Drum Sander

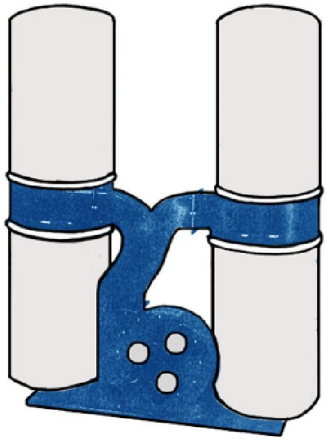


Dust Collectors

Dust Collectors - Single Stage

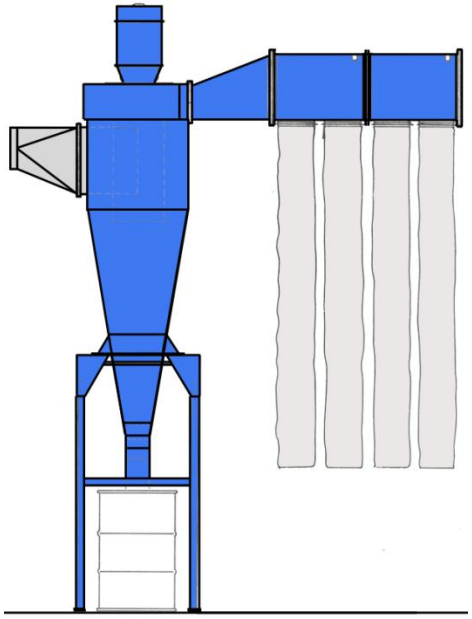


Single stage dust collector
(Blower and Filters ONLY)

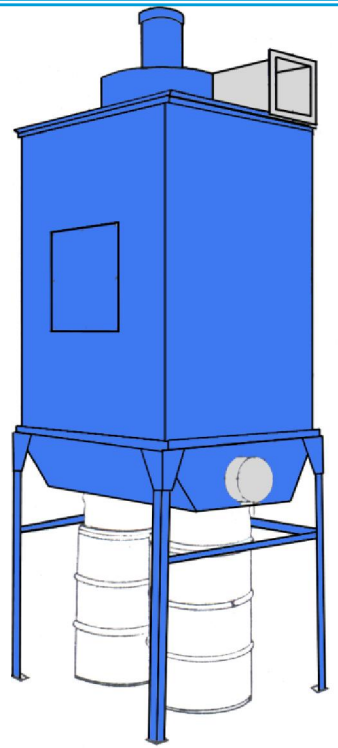


Dust Collectors - Two Stage

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

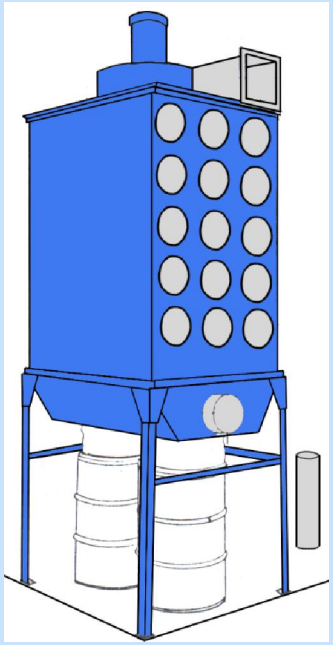


Dust Collectors



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

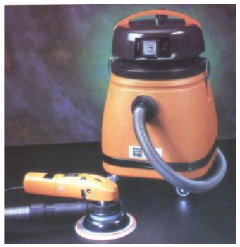
Cartridge Filtration - Fine Dust

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

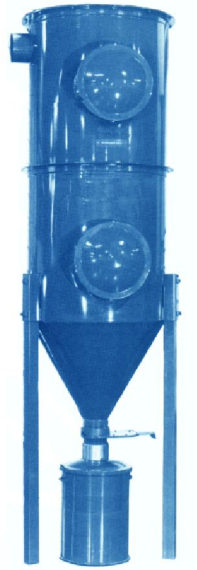
Dust Collectors - High Velocity Vacuum

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

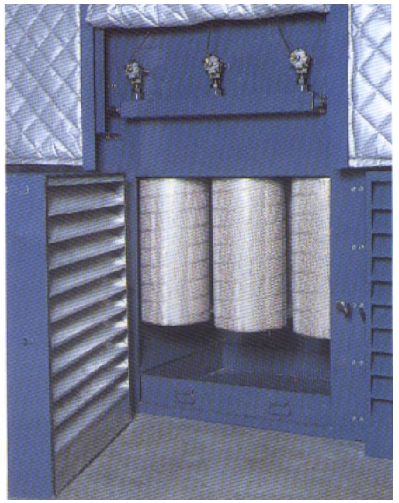


High Velocity Dust Collector



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

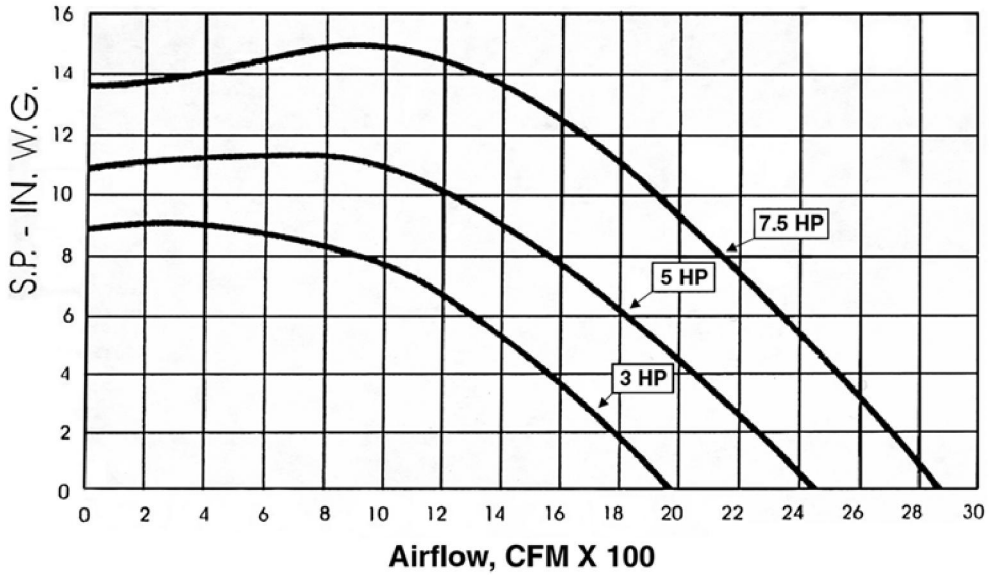
Dust Collectors

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

Dustek Operational Capabilities as listed in literature

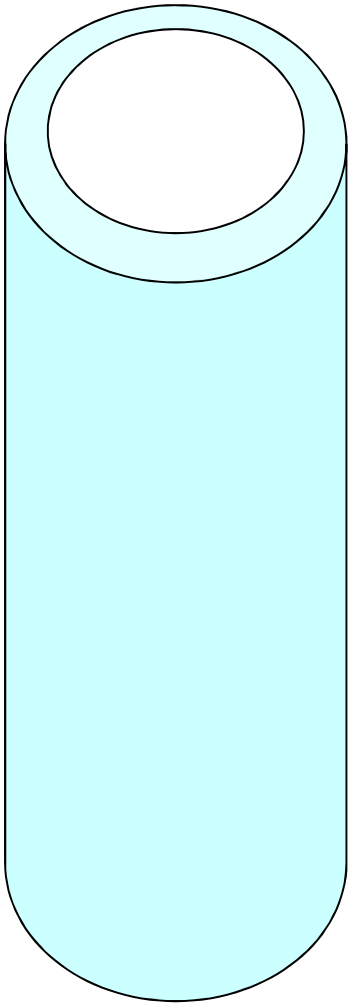
Model	300	500	750	1000
Motor HP	3	5	7-1/2	10
Speed RPM	3450	3450	3450	3450
Collection Capacity Ft.	15	30	45	45
Filter Area Sq. ft.	25	50	75	100

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

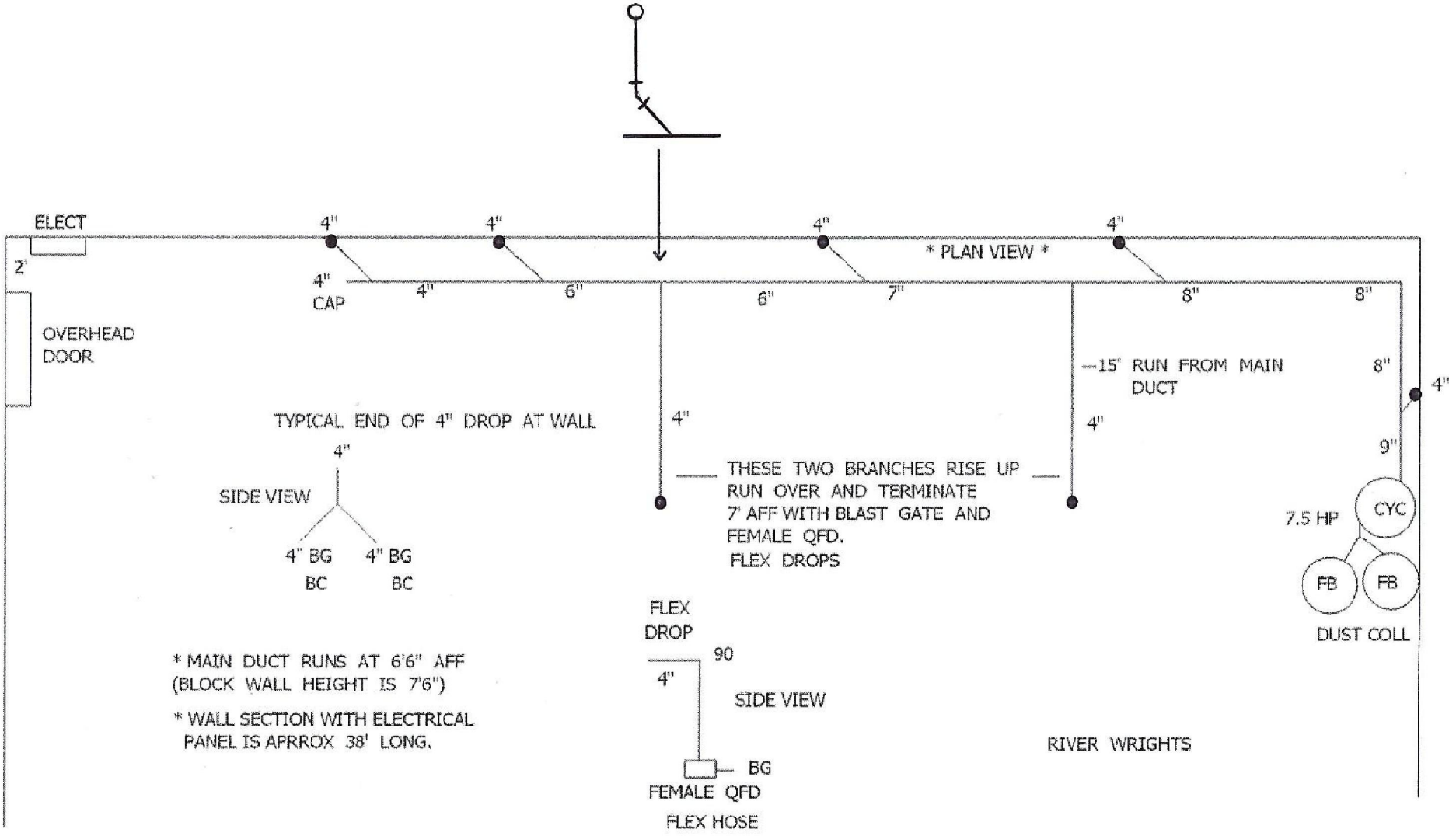


Filter Media

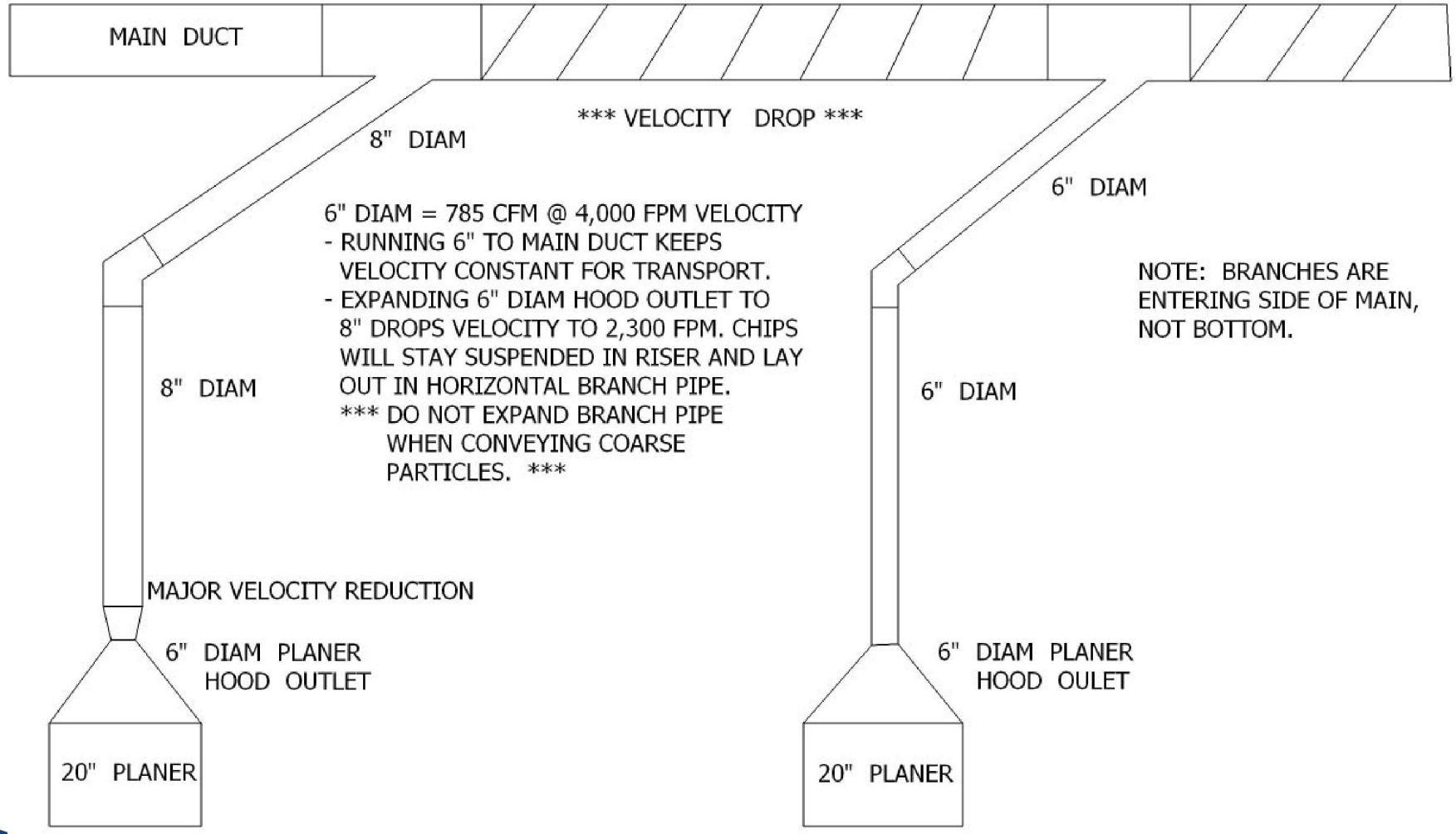
Construction	Medias	Plain	Glazed	Acrylic	Flame Retardant	Teflon	Singed	Silicone
Needled Felts	Polyester	*	*	*	*	*	*	*
	Polypropylene	*	*			*	*	*
	Wool	*			*		*	
	Nylon	*			*		*	
	Orlon	*			*		*	
	Teflon	*						*
	Nomex	*				*	*	
	Ryton	*				*	*	
	P-84	*				*	*	
Woven Material	Cotton	*			*			
	Glass	*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

Design Information



Design Information - Velocity Drop



Additional Resources

See attached documents

- White page

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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