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

<table>
<thead>
<tr>
<th>Diameter</th>
<th>0”-10” W.G.</th>
<th>10”-20” W.G.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3”-7”</td>
<td>26 Ga.</td>
<td>26 Ga.</td>
</tr>
<tr>
<td>8”</td>
<td>26 Ga.</td>
<td>26 Ga.</td>
</tr>
<tr>
<td>9”-12”</td>
<td>24 Ga.</td>
<td>24 Ga.</td>
</tr>
<tr>
<td>16”-18”</td>
<td>22 Ga.</td>
<td>20 Ga.</td>
</tr>
<tr>
<td>19”-22”</td>
<td>22 Ga.</td>
<td>18 Ga.</td>
</tr>
<tr>
<td>24”-26”</td>
<td>20 Ga.</td>
<td>18 Ga.</td>
</tr>
</tbody>
</table>
Piping - Elbows

Die Formed Smooth (PREFERRED)

1.5 diameter C.L.R.

Gored (ACCEPTABLE)

1.5 diameter C.L.R.

Gored (ACCEPTABLE)

2.5 diameter C.L.R.

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 Tee on Taper (PREFERRED)**
- **45° Double Cross Reducing Lateral (AVOID)**
- **Boot Tee (PREFERRED)**
Piping - Junction Fittings

- All branches should enter the main at a maximum of a 45° 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.


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 - 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.

45° 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

[Diagram showing Pop Rivets and Screws]
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

Beam Clamp
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.
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

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

Bag House

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.
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

<table>
<thead>
<tr>
<th>7 ½ HP Cyclone</th>
<th>Air Delivery CFM</th>
<th>Inlet Velocity (FPM)</th>
<th>External Static Pressure (Inches W.G.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10” Inlet</td>
<td>3500</td>
<td>6450</td>
<td>4.40”</td>
</tr>
<tr>
<td>12” Outlet</td>
<td>3000</td>
<td>5460</td>
<td>7.40”</td>
</tr>
<tr>
<td></td>
<td>2460</td>
<td>4510</td>
<td>10.25”</td>
</tr>
<tr>
<td></td>
<td>1950</td>
<td>3580</td>
<td>13.45”</td>
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</tbody>
</table>
# Airflow - Single Stage

## Woodtek Operational Capabilities as listed in literature

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

* UVFR – Woodtek term – Useful Volume Flow Rate - CFM
### Airflow - Single Stage

Dustek Operational Capabilities as listed in literature

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

### Fan Inlet Pressure (I.W.G.) vs. Air Flow Rate (CFM)

<table>
<thead>
<tr>
<th>Model</th>
<th>300 CFM</th>
<th>400 CFM</th>
<th>500 CFM</th>
<th>750 CFM</th>
<th>1000 CFM</th>
<th>1250 CFM</th>
<th>1500 CFM</th>
<th>2000 CFM</th>
<th>2500 CFM</th>
<th>3000 CFM</th>
<th>3500 CFM</th>
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<tbody>
<tr>
<td>300</td>
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<td>7.2</td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>500</td>
<td></td>
<td></td>
<td>11.4</td>
<td>11.2</td>
<td>10.2</td>
<td>8.7</td>
<td>6.5</td>
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<tr>
<td>750</td>
<td>8.6</td>
<td>8.5</td>
<td>8.4</td>
<td>8</td>
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<td>7.1</td>
<td>6.6</td>
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<td>1000</td>
<td>10</td>
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<td>9.8</td>
<td>9.6</td>
<td>9.0</td>
<td>8.4</td>
<td>7.6</td>
<td>6.8</td>
<td>4.7</td>
<td></td>
</tr>
</tbody>
</table>

*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
- A lot of filter surface area in confined space (pleated style)
- Easy, fast replacement
# Filter Media

<table>
<thead>
<tr>
<th>Construction</th>
<th>Medias</th>
<th>Plain</th>
<th>Glazed</th>
<th>Acrylic</th>
<th>Flame Retardant</th>
<th>Teflon</th>
<th>Singed</th>
<th>Silicone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needled Felts</td>
<td>Polyester</td>
<td>*</td>
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<td>*</td>
<td>*</td>
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<tr>
<td></td>
<td>Polypropylene</td>
<td>*</td>
<td>*</td>
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<td>*</td>
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<tr>
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<td>Wool</td>
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<td>Nylon</td>
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<td>*</td>
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<tr>
<td></td>
<td>Orlon</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Teflon</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Nomex</td>
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<tr>
<td>Woven Material</td>
<td>Cotton</td>
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<tr>
<td></td>
<td>Glass</td>
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<td>*</td>
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<tr>
<td></td>
<td>Polyester</td>
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<td></td>
<td>Polypropylene</td>
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</tr>
</tbody>
</table>

- **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**

**Recommended Minimum Dust Velocities**

<table>
<thead>
<tr>
<th>Dust Type</th>
<th>Branches</th>
<th>Mains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metalworking dusts</td>
<td>4500 FPM</td>
<td>4000 FPM</td>
</tr>
<tr>
<td>Woodworking &amp; other light dusts</td>
<td>4000 FPM</td>
<td>3500 FPM</td>
</tr>
</tbody>
</table>

**Conveying Velocities**

<table>
<thead>
<tr>
<th>Materials Conveyed</th>
<th>Conveying Velocity in Ducts-FPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vapors, fumes, very fine dusts</td>
<td>1500-2000</td>
</tr>
<tr>
<td>Fine dry dust</td>
<td>3000-3500</td>
</tr>
<tr>
<td>Average industrial dusts</td>
<td>3500-4000</td>
</tr>
<tr>
<td>Coarse particles</td>
<td>3500-4500</td>
</tr>
<tr>
<td>Large, heavy loads, moist materials</td>
<td>4500 &amp; higher</td>
</tr>
</tbody>
</table>

**Chart 1**

<table>
<thead>
<tr>
<th>CFM Requirements for diameter at specified velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dia.</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>3”</td>
</tr>
<tr>
<td>4”</td>
</tr>
<tr>
<td>5”</td>
</tr>
<tr>
<td>6”</td>
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<tr>
<td>7”</td>
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<td>8”</td>
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<tr>
<td>9”</td>
</tr>
<tr>
<td>10”</td>
</tr>
<tr>
<td>12”</td>
</tr>
<tr>
<td>14”</td>
</tr>
</tbody>
</table>

**Chart 2**

<table>
<thead>
<tr>
<th>Static Pressure based on 100’ of Pipe</th>
<th>Elbow to Straight Pipe Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dia.</td>
<td>3500 FPM</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td>3”</td>
<td>7.5</td>
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<tr>
<td>4”</td>
<td>5.5</td>
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<tr>
<td>5”</td>
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<td>6”</td>
<td>3.5</td>
</tr>
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<td>7”</td>
<td>2.8</td>
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<td>8”</td>
<td>2.4</td>
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<tr>
<td>9”</td>
<td>2.0</td>
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<tr>
<td>10”</td>
<td>1.8</td>
</tr>
<tr>
<td>12”</td>
<td>1.5</td>
</tr>
<tr>
<td>14”</td>
<td>1.3</td>
</tr>
</tbody>
</table>
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

Duct Run Resistance
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

Dust collector is connected to the main duct with a 3-ft. section of flexible hose.

Main duct, 5 in. dia. by 20 ft. long

Gate

Flexible hose, 4 in. dia. by up to 5 ft. long

Y connector, 45°

3 ft.
Design Information - Velocity Drop

6" DIAM = 785 CFM @ 4,000 FPM VELOCITY
- RUNNING 6" TO MAIN DUCT KEEPS
VELOCITY CONSTANT FOR TRANSPORT.
- EXPANDING 6" DIAM HOOD OUTLET TO
8" DROPS VELOCITY TO 2,300 FPM. CHIPS
WILL STAY SUSPENDED IN RISER AND LAY
OUT IN HORIZONTAL BRANCH PIPE.
*** DO NOT EXPAND BRANCH PIPE
WHEN CONVEYING COARSE
PARTICLES. ***
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 Sander Nagyalsy: Sander gives you practical, shop-tested solutions to total dust control so you can build the right system for your shop without complex calculations.

Part #: TF8WDC. SCFCOVER, 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 in a common term is called “friction.”
- 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.)

<table>
<thead>
<tr>
<th>Type of Dust</th>
<th>Velocity in Branches</th>
<th>Velocity in Main</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metalworking Dust</td>
<td>4500 FPM</td>
<td>4000 FPM</td>
</tr>
<tr>
<td>Woodworking Dust</td>
<td>4000 FPM</td>
<td>3500 FPM</td>
</tr>
<tr>
<td>Other Light Dust</td>
<td>4000 FPM</td>
<td>3000 FPM</td>
</tr>
</tbody>
</table>

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. Round off to the nearest inch. When writing 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 your parts list see 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 CFM, total of the two primaries. You will follow this practice all the way to the collector, sizing all primary junctions to accommodate total CFM of all primaries at that point. Do not increase main duct size when a branch other than a primary enters. Your total CFM requirement is the total of all primary branches. When not using a primary machine you will close biastage and divert suction to a secondary machine.

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

<table>
<thead>
<tr>
<th>Machine</th>
<th>Diameter</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table Saw, Lathe</td>
<td>4” Diameter</td>
<td>350 CFM</td>
</tr>
<tr>
<td>Radial Saw</td>
<td>5” Diameter</td>
<td>550 CFM</td>
</tr>
</tbody>
</table>

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 (3600 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 (1700=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 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

<table>
<thead>
<tr>
<th>Dia</th>
<th>CFM requirements for diameter at specified velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;</td>
<td>500 FPM</td>
</tr>
<tr>
<td>4&quot;</td>
<td>750 FPM</td>
</tr>
<tr>
<td>5&quot;</td>
<td>1000 FPM</td>
</tr>
<tr>
<td>6&quot;</td>
<td>1350 FPM</td>
</tr>
</tbody>
</table>

## Chart 2

<table>
<thead>
<tr>
<th>Dia</th>
<th>Static Pressure based on 100 of Pipe.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;</td>
<td>5.5 &quot;</td>
</tr>
<tr>
<td>4&quot;</td>
<td>7.0 &quot;</td>
</tr>
<tr>
<td>5&quot;</td>
<td>8.5 &quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>10.0 &quot;</td>
</tr>
</tbody>
</table>

### 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 for simplicity it usually equals a loss of 1" water gauge. (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 linear 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 length 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. Flexible 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 flexible hose 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**

<table>
<thead>
<tr>
<th>Description - 4&quot; Diameter</th>
<th>Equivalent to Straight Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straight Pipe</td>
<td>20&quot;</td>
</tr>
<tr>
<td>2 - 90° Elbows</td>
<td>12&quot;</td>
</tr>
<tr>
<td>1 - 45° Elbows</td>
<td>6&quot;</td>
</tr>
<tr>
<td>5' Flexible (3x)</td>
<td>15&quot;</td>
</tr>
<tr>
<td>Total equivalent straight pipe after conversions</td>
<td>35&quot;</td>
</tr>
<tr>
<td>Total equivalent straight pipe after conversions</td>
<td>35&quot;</td>
</tr>
<tr>
<td>350 CFM in 4&quot; diameter = 7.1 S.P. per 100'</td>
<td></td>
</tr>
<tr>
<td>350 CFM in 4&quot; diameter = 3.711 S.P. per 53'</td>
<td></td>
</tr>
</tbody>
</table>

### 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.

### Total Static Pressure 1" + 2" + 3.711" + .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, straps, clamps, and couplings. For ordering please call: (800) 387-3828; Fax: (800) 438-7135; or Mail: Air Handling Systems, 5 Lunar Drive Woodbridge, CT 06625 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 flexible hose.
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.
Dust Collection Q&A

Why should I buy dust collection?
One important reason is to avoid the health risks. 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 or allergic reactions:
- Silica dust can cause silicosis
- Wood dust can cause asthma or respiratory problems
- Metal dust can cause dermatitis or respiratory problems
- Paint dust can cause respiratory problems or allergic reactions

Dust collection is used to capture these harmful dust particles before they can enter the workplace.

How does one go about grounding a PVC plastic pipe system?
I am not sure about typical plastic pipe systems. However, in general, grounding is important to ensure safety and prevent electrical shock hazards.

Grounding involves connecting a conductor to the earth to reduce the risk of electrical shock. This can be done by using a ground wire or by connecting the pipe system to a grounded electrical system.

Metal and Furnace in the Dust Collection System
Metal and furnace dust can pose a significant risk to the health of workers. It is important to have a proper dust collection system in place to prevent the exposure of workers to these hazardous materials.

When setting up an air-handling system, it is important to ensure that it is compatible with the dust collection system. This involves selecting the appropriate type of dust collection system and ensuring that it is properly installed and maintained.

When installing a new dust collection system, it is important to test the system to ensure that it is functioning properly. This can be done by using a monitoring device to check the efficiency of the system.

What is the difference between a single-stage and a two-stage collector?
A single-stage collector is designed to remove large particles from the air. A two-stage collector is designed to remove both large and small particles from the air.

A single-stage collector typically consists of a cyclone and a bag filter, while a two-stage collector may include an additional filter stage.

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

Air Handling Systems
5 Lunar Drive, Woodbridge, CT 06855
(800) 403-8878 (Fax) 800-438-7135
www.airhand.com e-mail: sales@airhand.com

Dust Control
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”
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