Dust Collection
In A Home Workshop

- Fine Dust Particles & Fine Wood Dust Properties
- Probability of Harm
- Components of a Good Shop Dust Collection System
- Tools Used To Capture Shop Dust
- Elements In Building A Dust Collection System
- Ducting Components
- Layout & Design
By definition airborne wood dust particles consist of particle material (PM) smaller than 30-microns that vanish without any visible trace when vented outside. The Airborne Particle Sizing picture on the right compares an average human hair of about 70-microns thick to 30-micron, 10-micron and 2.5-micron dust particles. A single micron is one millionth of a meter and a meter is about 39" long. Researchers and health experts work with fine dust so much they abbreviate fine dust as PM short for particulate material followed by a particle size number. PM-10 is shorthand for particles smaller than (<) 10 microns, PM-5 for those sized under 5-microns and PM-2.5 for those sized under 2.5-microns.

* Note: information and image captured from Bill Pentz.com
Fine Wood Dust Properties

When viewed with a strong microscope wood looks and behaves like a big stack of glued together very fine glass tubes that can be cleanly cut as shown in the first picture on the right. When viewed by an electron microscope we see even the cleanest looking cut ends up with lots of very nasty looking pieces as shown in the second picture on right. **Note in the third picture that these particles have razor sharp edges and sharp often barbed points.** My friend who specializes in micrographs (electron microscope pictures) said **fine wood dust looks like a glued up mess of broken tooth picks and razor blades.**

We know from our particle counters that every time our hand and power tool blades, bits, cutters, scrapers and even sandpaper touch wood, at the point of contact these tiny dried tubes explode into billions of fine airborne dust particles.

*Note: information and image captured from Bill Pentz.com*
Probability of Harm

- As shown in this graphic the finer the particles the deeper into our respiratory systems they go and more harm they cause. The under 5-micron particles cause the most health damage because they go deepest into our respiratory systems. Most fine dust particles, particularly fine wood dust particles have razor sharp edges and sharp often barbed points that cut, tear, stab and jam these particles stuck deep in our respiratory systems. These lodged particles cause swelling and scaring that reduces our airflow.

- The Internet has considerable inaccurate information, but that peer reviewed medical information verified by expert physicians shows every exposure to fine dust of every type causes a measurable loss of respiratory function, some of this loss becomes permanent, and the greater and longer the exposure the higher the damage. Over time this damage builds into chronic obstructive pulmonary disease (COPD) meaning our lungs get so damaged we cannot breathe well.

* Note: information and image captured from Bill Pentz.com
Probability of Harm

- Worse, fine dusts contain and carry toxic chemicals that when trapped in our lungs cause serious short and long term health problems. Woodworkers should always check a good wood toxicity table before using any wood because the dust we inhale can contain chemicals which are poisonous, strong irritants, sensitizers meaning they cause us to build ever stronger allergic reactions, and can increase our risk of cancer. Also, fine dusts often carry many other toxic chemicals from glues, finishes, fillers, insecticides, preservatives, molds, yeasts, mildews, etc. that can be present without our knowledge and can harm our health.

* Note: information and image captured from Bill Pentz.com
Components of A Good Shop Dust Collection System

- Chip collection
- Fine dust collection
- Airborne dust collection
Tools Used To Capture Shop Dust

Typical Dust Collector Configuration

Cartridge Dust Collector Configuration

Typical Cyclone Configuration

* Note: image captured from Bill Pentz.com
Typical Dust Collector
With Trashcan Separator

* Note: image captured from Bill Pentz.com
Dust Collector
With Cyclone Separator

* Note: image captured from Bill Pentz.com
Portable Vacuum With Dust Deputy

Works with All Shop Vacuums
Air Cleaners
Respirators
Elements In Building A Dust Collection System

• Air flow
  A. Air speed
  B. Air volume
  C. CFM requirements

• Suctioning

• Resistance calculations

• Blower size

• Blower fan table

• Ducting design

• Filter basics
  A. Filter types
  B. Filter type
  C. Filter life
  D. Filtering level
  E. Filtering resistance
  F. Filter sizing

* Note: image captured from Bill Pentz.com
Ducting Components  
(Metal & Plastic)

- Ducting accessories
- Blast gates
- Flex hose & hose clamps
- Fittings
  A. Wyes
  B. Elbows
  C. Homemade fittings
  D. Transitions

* Note: image captured from Bill Pentz.com
Layout & Design

- Fire safety
- Pipe size
- Ducting resistance
- Ducting reductions
- Ducting material
- Ducting cost
- Ducting connections (hanging / underfloor)

* Note: image captured from Bill Pentz.com
Example Of Ducting Layout

* Note: image captured from Bill Pentz.com
Example of Dust Collection Systems
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Thank you