

# Risk Control Bulletin

## Combustible Dust: Wood Dust Exposures & Controls

### Introduction

The number one industry type and the number one dust type involved in combustible dust explosion and fire losses are woodworking and wood dust, respectively. Woodworking and wood dust are responsible for more than a third of all fire and explosion losses involving combustible dust. This being the case, those involved in the woodworking industry should have a good understanding of the exposures presented by wood dust and the controls needed to reduce the potential for loss.

### Characteristics of Wood Dust & Dust Explosions

When materials burn, hot gases are released and pressure is increased. If the rate of combustion is high enough, the rate of pressure rises and the ultimate maximum pressure can be destructive. That is the essence of an explosion. For example, a piece of wood and a quantity of wood dust may have the same weight, but the rate of combustion of the first is far less than the second because the dust has a much larger total surface area. In an experimental wood dust explosion, a rate of pressure rise of 5,500 psi/sec was recorded, along with a maximum pressure of 113 psi (8 tons per square foot). Some other important characteristics are:

- **Particle Size:** The smaller the particles, the greater the hazard. Wood dust is considered explosive if the average particle size is under 420 microns ( $\sim 1/64$ " ). 420 microns is 3-4 times the size of table salt.
- **Concentration:** For an explosion to occur there must be a minimum explosive concentration (MEC) of dust suspended in air. The MEC for wood flour (white pine) is only 0.035 ounces per cubic foot. This is less than  $\frac{1}{2}$  teaspoon of dust per cubic foot of air.
- **Moisture:** Increasing the moisture content of wood dust will raise the ignition temperature of the dust. However, increasing the moisture content is not a practical method of preventing dust explosions.
- **Confinement:** Another condition needed for an explosion is a confined space.

The explosive pressure needs a surface area to act on. The confined space could be the inside of a piece of equipment (exhaust duct, air-material separator, wood waste collection bin, etc.), the inside of a building, or both.

- **Ignition Source:** This is the last condition that is needed for an explosion – the presence of an ignition source to ignite the dust cloud.

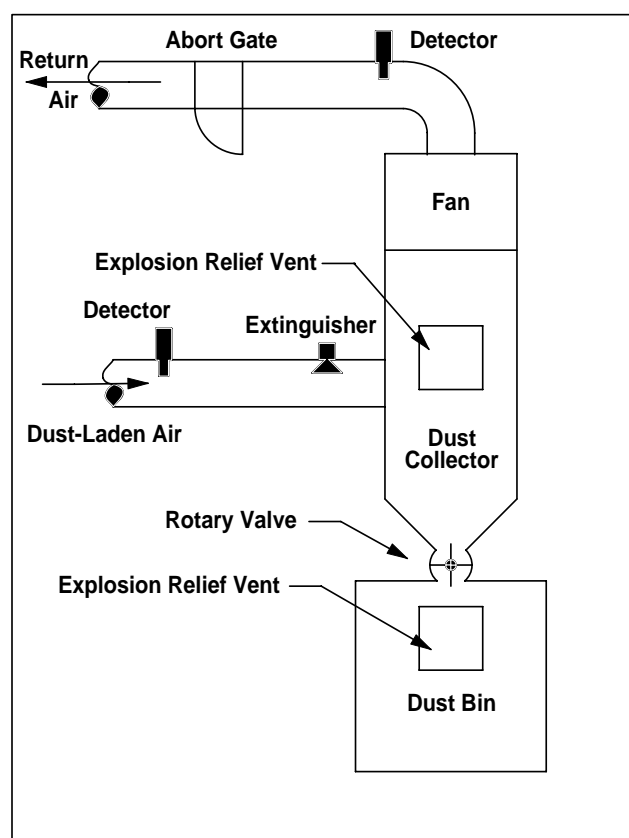


Figure 1

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## Controls to Prevent Wood Dust Fires & Explosions

Keep in mind that while explosions can be prevented by eliminating any one of the conditions needed for an explosion, there are only two things that prevent wood dust fires: eliminate the wood dust or eliminate ignition sources.

- Housekeeping: Good housekeeping practice means never allowing dust deposits on surfaces to exceed a thickness of 1/16." Dust layers should be removed with brooms or with vacuum cleaners approved for use in dusty areas. Compressed air should not be used to blow dust off of surfaces.
- Dust Collection Systems (Figure 1):
  - Inspect and maintain systems to keep them in good operating condition.
  - Make sure intake points are effective in capturing wood dust being liberated.
  - To maintain a "healthy" duct system, make sure there is adequate air speed to prevent fallout of wood dust and avoid explosive dust-air mixtures (Figure 2).
  - Protect dust collectors per NFPA 664, using devices such as spark detection and extinguishing systems, explosion relief vents, diverter devices (e.g., abort gates) and blocking devices (e.g., rotary valves).
- Ignition Sources:
  - Periodically audit areas where dust can accumulate for control of all ignition sources.
  - Hot Work: Establish designated areas and use a permit system.

- Smoking: Confine to safe designated areas.
- Electrical: Approved for hazardous area where needed. Preventive maintenance.
- Static Electricity: Control with Bonding and Grounding. Use conductive air hoses.
- Friction and Sparks: Properly set-up and maintain machinery, maintain alignment and provide adequate lubrication.
- Foreign Material: Inspect wood stock and use tramp metal magnets at intakes.

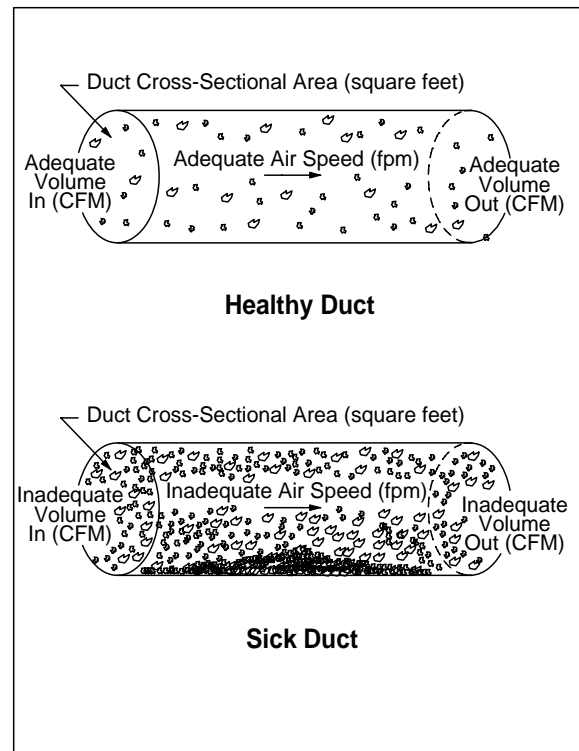


Figure 2