CONTRACTOR INFORMATION

This workplace has a Combustible Wood Dust Mitigation and Control Program

The purpose:

- To control combustible wood dust accumulation and potential ignition sources
- To prevent a combustible wood dust fire, deflagration, or explosion.

All employees and contractors are expected to work in accordance with that program.

Any contractor activity that introduces a new combustible dust hazard is an at-risk activity and must be pre-planned to mitigate the risk. The new hazard would include one or more of the following:

1. **Added Fuel**: Activity produces wood dust, especially fine particle size dust.
2. **Dispersion of Fuel**: Activity disperses wood dust (pre-existing accumulation or newly created) into a thick cloud.
3. **Containment of Dispersed Fuel**: Activity disperses fuel, as a cloud, in an enclosed space or room.
4. **Introduction of Ignition Sources**: Activity introduces one or more ignition sources (e.g., heaters, hot work, hot equipment, spark generating tools) in areas where wood dust accumulation already exist or are being created by the activity, in the general work area, in designated hazardous locations, and around or within a passive containment system, or dust collection system components such as duct work and dust collector (baghouses, cyclones, etc.).
5. **Any activity** that might interfere with the proper functioning of the workplace's existing dust accumulation and ignition source controls.
6. **Any activity** that might interfere with the proper functioning of the workplace's existing equipment and systems for fire suppression and explosion prevention.

Why?

When finely divided (i.e., powdered) wood dust is allowed to accumulate in the workplace, it becomes a significant fire and explosion hazard. All that is required is for some activity or event to disperse the wood dust into an airborne cloud and contact an ignition source.

For small amounts of dust, the result will be a large fireball, which is capable of severely burning workers; if the activity or event occurs in an enclosure or room with larger amounts of wood dust, a powerful explosion will result, which is capable of severely injuring or killing workers and causing significant property damage.

Refer to the *Combustible Dust Awareness Quick Guide* for more information.

Pre-Planning

Pre-planning to eliminate or minimize the risk and the proper execution of the plan are important.

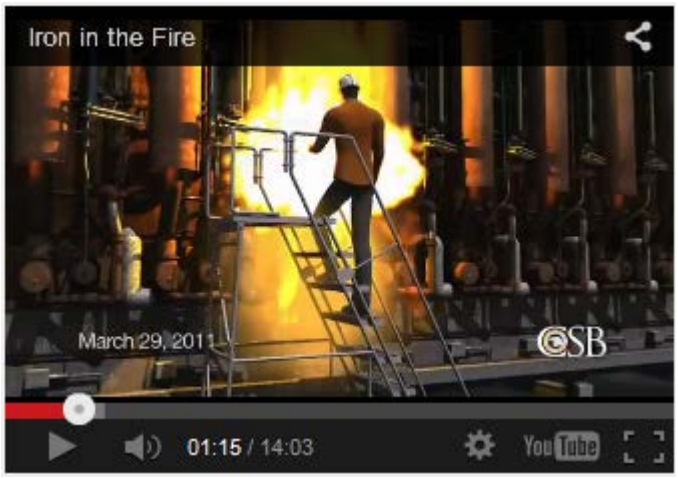
For those hazard and risks that cannot be eliminated, the contractor will work with the workplace's management to develop appropriate controls and safe work procedures for the planned activities. These safe work procedures include hot work permits and housekeeping (i.e., wood dust and tramp metal/foreign contamination) before, during and after activity.

The dust explosion incident summarized below is based on an actual incident, although not wood dust. The outcome would have been the same had the combustible dust been wood dust.

Example: Working in the presence of existing combustible dust accumulation

As part of an ongoing furnace improvement project, a company engineer and an outside contractor were replacing igniters on a band furnace.

The pair experienced difficulty in reconnecting a particular natural gas line after replacing an igniter. The vibration, caused by using a hammer to force the gas port to reconnect, inadvertently lofted large amounts of combustible iron dust from flat surfaces on the side of the band furnace, spanning 20 feet above them.



Source: Chemical Safety Board
http://www.csb.gov/hoeganaes-corporation-fatal-flash-fires/

As soon as the dust dispersed, the engineer recalled being engulfed in flames. One worker died. The ignition source was the hot surface of the furnace.

The contractor activity disturbed an existing accumulation of combustible dust near an existing ignition source, i.e., the hot furnace surface.

Pre-job planning would have required the removal of the combustible dust accumulation. If possible, the furnace could have been shut down and allowed to cool before the work began thus removing a potential ignition source.

Combustible Dust Awareness Quick Guide

What is a Dust Explosion?

The ignition and very rapid burning of a dust cloud in an enclosure or container causing a pressure rise (i.e., shock wave) that bursts or ruptures the enclosure or container. The event's first explosion is called the primary explosion, which can start a chain reaction of secondary explosions.

In order to explode, the dust cloud needs certain characteristics:

- The dust must be relatively dry – less of a factor at smaller particle sizes and more of a factor at large particle sizes.
- The dust particle size must be fine enough to be airborne – typically secondary dust – see definition below.
- The airborne concentration must be at its Minimum Explosive Concentration (MEC). The dust cloud is "in the range" when you can't see a 25 watt light bulb six feet away.

Combustible wood dust can be categorized as:

- **Primary dust:** Created by production or other work processes. Found on floors and surfaces near or below the dust producing or waste handling equipment, they are the source for secondary dusts. While primary dusts may consist primarily of greener, moister and coarser particulate, unmanaged primary dusts will over time release the finer, drier secondary dusts if they are not promptly abated and are disturbed.
- **Secondary dust:** The finer, drier dusts that are broadly dispersed and that settle away from the production area [usually rafters, ceilings, and beam, ductwork, walls, joints, top of machinery]. Secondary dusts are often the fuel source for serious fires and explosions: where "secondary" dusts are present at 1/8" over 5% of the work area they present a significant fire/explosion hazard.

How an Explosion Occurs

A dust explosion can occur when the five basic conditions of the 'Dust Explosion Pentagon' come together in a "perfect storm" scenario.

Figure 1: Dust Explosion Pentagon

1. *Fuel*, e.g., combustible dust
2. *Ignition source*, e.g., spark, friction, hot surfaces, open flame
3. *Oxidant*, e.g., oxygen in air
4. *Dispersion*, e.g., a dust cloud of dry wood dust at or above its Minimum Explosive Concentration (MEC)
5. *Confinement*, e.g., closed room, inside equipment or dust collector

Combustible dust is a finely divided particulate solid (e.g., typically the size of granulated sugar or smaller) that presents a flash fire hazard or explosion hazard when suspended in air.

Primary Explosion: The event's first explosion typically occurs in a dust collection system or processing equipment where dust clouds can easily form, or a small area where accumulated fugitive dust is disturbed to form a dust cloud.

Secondary Explosion: The primary explosion's shock wave will disturb accumulated (secondary) dust in the surrounding area creating another dust cloud. The shock wave is followed by burning dust thrown by the primary explosion, igniting the newly formed dust cloud and causing a secondary explosion. In similar fashion to the primary explosion, secondary explosions can trigger more secondary explosions. All large scale dust explosions result from chain reactions of this type.

Combustible Dust Awareness Quick Guide

How to Prevent an Explosion

Prevent **one** explosion pentagon element from existing and an explosion is not possible.

"The most effective mitigation strategy is to minimize dust accumulation."

- Dust collection systems that capture the dust at the source and transport the dust to a collection point for disposal are the "first best solution where practicable."
- Passive containment systems prevent the primary dust from spreading and allow for manual removal.
- Good housekeeping practices prevent fugitive secondary dusts from accumulating to unsafe levels in the general work area.

Good housekeeping practices means: regularly scheduled, in areas known for primary and secondary dust accumulation, using appropriate methods that prevent or minimize the generation of dust clouds.

- Sometimes, for a variety of reasons, secondary dust may accumulate and some event will disperse that accumulation into a dust cloud.
- Some methods of preventing the accumulation of combustible dust actually create an environment where the ignition source is the only missing element (e.g., a dust collector). For these reasons, there also needs to be a program to manage potential ignition sources, including:

• *Hot Works*	• *Mechanical Sparks*	• *Open flames / heating equip.*
• *Hot Equipment*	• *Overheating (e.g., friction)*	• *Facility lighting*
• *Hot Surfaces*	• *Electrical Equipment (e.g., arcing)*	• *Tramp Metal*

Combustible Dust Accumulation Vigilance – What to Look For

1. ***General Housekeeping*** *– if there is too much dust accumulation (i.e., secondary dust levels approaching 1/8" over 5% of the area, or 1000 ft^2, whichever is smaller), determine why and correct.*

2. ***Dust Collection Systems***
   - ***a.*** *If dust is not being captured at the source, determine why and correct.*
   - ***b.*** *If dust is building up inside the duct work, determine why and correct.*
   - ***c.*** *If dust is escaping the duct work or collector, determine why and correct.*
   - ***d.*** *If tramp metal or other contaminants (i.e., potential ignition sources) are getting into the dust collection system, determine why and correct.*

3. *If there is a history of fires in the facility, investigate their causes and correct. Why? If conditions had been a little different, it may have been an explosion instead of a fire.*

Learn from these near misses!!

Major Explosion Hazard

∗ Excessive secondary dust levels (See item #1 above)

∗ Presence of significant dust cloud(s)