Hazardous Locations
Combustible Wood Dust
Objective

Our Aim is to improve awareness of:

• Hazardous Locations - Combustible Wood Dust
• Existing Codes and Standards for Safe Electrical and Gas installations in Hazardous Locations
• Opportunities and Requirements for Improvement
Introduction

The first documented dust explosion occurred in a Turin, Italy, bakery in 1785.

- The explosion was caused by the ignition of flour dust by a lamp in a bakery storeroom.
- It lead to the realization that grain dust is a highly explosive substance that must be handled carefully.
Babine Forest Products, Burns Lake BC

Explosion and Fire - January 20, 2012

2 Fatalities, 20 Injuries
Lakeland Mills Ltd., Prince George BC

Explosion and Fire - April 23, 2012

2 Fatalities, 22 Injuries
Public Release of Investigation Reports Delayed

- BC Safety Authority’s investigation reports include witness statements and other evidentiary details.

- BC Safety Authority is withholding the public release of its investigation reports.
  - Balance our respect for Crown Counsel’s review process of WorkSafeBC reports with our responsibility for promoting safety.
  - Can not comment or speculate upon the review by Crown Counsel.

- BC Safety Authority released nine recommendations resulting from these investigations.

Investigation Recommendations

• A total of nine recommendations were made by BC Safety Authority

• Recommendations were made to:
  – Owners and operators of wood processing facilities
  – The BC Office of the Fire Commissioner
  – The Canadian Standards Association

• Aim of the recommendations is to improve:
  – Standards and guidelines associated with the identification of hazardous locations due to combustible wood dust;
  – Documentation of necessary plans for managing hazardous locations due to combustible wood dust; and
  – Education materials and professional qualifications for individuals who conduct assessments of hazardous locations.
Standards for Fire Hazard

NFPA: National Fire Protection Association

NFPA publish a number of standards related to fire and explosion hazards which are the primary North American standards in this area.
Standards for Fire Hazards

Standard 499 “Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas”

• referenced by numerous standards and regulations in North America

• considered the defacto standard for classification of hazardous locations containing electrical or gas systems.
Standards for Fire Hazards

**Standard 664** “Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities”

- referenced in the BC Fire Code as a good engineering practice. Also references material within NFPA 499.
Standards for Fire Hazards

IEC: International Electrotechnical Commission

IEC produce similar standards which are used in Europe and elsewhere. IEC 60079-10-2
Classification of Areas – Combustible Dust Atmospheres
What is Combustible Dust?

NFPA 499 Definition

*Finely divided solid particles that present a dust fire or dust explosion hazard when dispersed and ignited in air*
What is Combustible Dust?

Combustible Dust is more accurately referred to as “deflagrable dust”.

NFPA 664 defines, in part, “deflagrable wood dust” as “Wood particulate that will propagate a flame front … when suspended in air … regardless of particle size or shape …”
What types of dust are combustible?

Examples of dust materials that are combustible while suspended in air include:

- Metal dust such as Aluminum, Iron, & Magnesium,
- Coal and other Carbon dusts,
- Plastic dust and additives,
What types of dust are combustible?

Examples of dust materials that are combustible while suspended in air include:

• Bio-solids,

• Other organic dust such as Sugar, Flour, Spices, Paper, Soap, and dried Blood,

• Certain textiles, AND,

• WOOD DUST!
Dust Combustibility

NFPA 664 continues the definition of “deflagrable wood dust” as:

“…wood particulate with a mass median particle size of 500 microns or smaller (i.e. material that will pass through a U.S. No. 35 Standard Sieve), having a moisture content of less than 25 percent (wet basis).”
# Size of Dust Particles

<table>
<thead>
<tr>
<th>Common Materials</th>
<th>Size (Microns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talcum powder, fine silt, red blood cells, cocoa</td>
<td>5 to 10</td>
</tr>
<tr>
<td>Saw dust, ginger</td>
<td>25 to 600</td>
</tr>
<tr>
<td>Pollen, milled flour, coarse silt</td>
<td>44 to 74</td>
</tr>
<tr>
<td>Table salt</td>
<td>105 to 149</td>
</tr>
<tr>
<td>Coarse sand</td>
<td>297 to 1,000</td>
</tr>
</tbody>
</table>

Particles may resemble: fibers, needles, flakes and spheres

*Courtesy of N.C. Department of Labor*

[www.nclabor.com](http://www.nclabor.com)
803 Microns

MC: 49.3 %
ACC Rate: 23811.5 g/m²/8hr
AV. Size: 803.0 μm
405 Microns
125 Microns
Dust Explosion Characteristics
Derived from Referenced Documents

<table>
<thead>
<tr>
<th>Material</th>
<th>Deflagration Index, $K_{st}$ (bar·m/s)</th>
<th>Explosion Pressure, $P_{\text{max}}$ (bar)</th>
<th>Dust Layer Ignition Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value</td>
<td>Group</td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>415²</td>
<td>3 (very strong explosion)</td>
<td>12.4²</td>
</tr>
<tr>
<td>Coal (bituminous)</td>
<td>129²</td>
<td></td>
<td>9.2²</td>
</tr>
<tr>
<td>Sugar</td>
<td>138²</td>
<td></td>
<td>8.5²</td>
</tr>
<tr>
<td>Wheat flour</td>
<td>87³</td>
<td>1 (weak explosion)</td>
<td>8.3³</td>
</tr>
<tr>
<td>Wheat starch</td>
<td>115²</td>
<td></td>
<td>9.9²</td>
</tr>
<tr>
<td>Wheat grain dust</td>
<td>112³</td>
<td></td>
<td>9.3³</td>
</tr>
<tr>
<td>Wood flour</td>
<td>205²</td>
<td>2 (strong explosion)</td>
<td>10.5²</td>
</tr>
<tr>
<td>Wood bark (ground)</td>
<td>Not Available</td>
<td>Not Available</td>
<td>Not Available</td>
</tr>
</tbody>
</table>

1. NFPA 499 – Classification of Combustible Dusts and of Hazards (Classified) Locations for Electrical Installations
2. NFPA 68 – Standard on Explosion Protection by Deflagration Venting
3. NFPA 61 – Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
4. OSHA 3371-08 2009 - Hazard Communication Guidance for Combustible Dusts – Occupational Safety and Health Administration. Four dust explosion classes are communicated for corresponding Kst ranges
   – 0 is assigned a “no explosion” characteristic.
   – Values between 0 and 200 is assigned a “weak explosion” characteristic.
   – Values between 200 and 300 are assigned a “strong explosion” characteristic and
   – Values above 300 are assigned a “very strong explosion” characteristic.
Fires

Cellulose material (wood) is the fuel in our examples, but any fuel can burn.

Burning is the process of rapid oxidization, which usually requires the presence of oxygen, normally found in air.

Fuel

Air

Ignition

A heat source to start the fire. There are many possibilities in a mill environment, such as: sparks from welding, electrical switches, static, mechanical impact or rubbing; open flames; smoldering material such as cigarettes; friction; heat from operation of equipment such as lights, heaters. Wood can undergo spontaneous combustion caused by decomposition.
Explosions

To create an explosion, 2 extra conditions are required.

Confinement is necessary to create a rapid pressure rise. Complete confinement is not necessary—for example, a wall, or bank of equipment may be enough to constrict the pressure wave expansion to create the explosion.

The wood dust must be dispersed—mixed in the air—to promote rapid burning.
Wood Dust Explosions

Dust explosions generally consist of a series of explosions

• The initial explosion may be quite small

• The pressure wave can dislodge more fuel (dust) by shaking the building

• The initial explosion then acts as the ignition source for the now dispersed fuel to create a secondary explosion
Wood Dust Explosions

Dust explosions generally consist of a series of explosions

- In some cases, tertiary or further explosions can result
- Each of the successive explosions occur fractions of seconds apart
- The confinement of the pressure wave by the building structure results in massive destruction
The “Typical” Explosion Event

Initial Internal Deflagration

Process Equipment

Time, msec.
The “Typical” Explosion Event

Initial Internal Deflagration

Shock Wave

Process Equipment

Time, msec.
The “Typical” Explosion Event

- Initial Internal Deflagration
- Elastic Rebound Shock Waves
- Process Equipment

Time, msec.: 0 25 50 75 100 125 150 175 200 225 250 300 325
The “Typical” Explosion Event

Initial Internal Deflagration

Dust clouds caused by Elastic Rebound

Process Equipment

Time, msec.
The “Typical” Explosion Event

Containment Failure from Initial Deflagration

Dust Clouds Caused by Elastic Rebound

Process Equipment

Time, msec.

0 25 50 75 100 125 150 175 200 225 250 300 325
The "Typical" Explosion Event

Dust Clouds Caused by Elastic Rebound

Secondary Deflagration Initiated

Time, msec.

0 25 50 75 100 125 150 175 200 225 250 300 325
The “Typical” Explosion Event

Process Equipment

Secondary Deflagration Propagates through Interior
The “Typical” Explosion Event

Secondary Deflagration Vents from Structure

Process Equipment

Time, msec.

0 25 50 75 100 125 150 175 200 225 250 300 325
The “Typical” Explosion Event

Secondary Deflagration
Causes Collapse and Residual Fires

“Typical” Explosion Event Diagrams Courtesy of
NFPA 499 – Classification of Combustible Dusts and Hazardous Locations

<table>
<thead>
<tr>
<th>Class I Locations</th>
<th>Class II Locations</th>
<th>Class III Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potentially explosive atmosphere due to gases or vapours</td>
<td>Presence of combustible dusts</td>
<td>Presence of easily ignitable fibres or mists</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zone 0</th>
<th>Zone 1</th>
<th>Zone 2</th>
</tr>
</thead>
</table>

**NFPA 497** – Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

**Class II Locations**

- **Division 1**: Continuous, intermittent or periodic explosive dust atmosphere during normal operation
- **Division 2**: Infrequent explosive combustible dust atmospheres due to operational malfunctions

**Class III Locations**

- **No dedicated standard**

- **Abnormal operation or failure of equipment might cause an explosive dust atmosphere and produce a source of ignition**

- **Presence of [Group E] electrically conductive combustible dust**

- **Combustible dust accumulations on, in, or in the vicinity of electrical equipment that interferes with heat dissipation or may be ignited by equipment operation or failure**
NFPA 499 – Classification of Combustible Dusts and Hazardous Locations

• 3 major types: vapours, dusts, fibres.

• Group G – Atmospheres containing combustible dusts not included in Group E or Group F, including flour, grain, wood, plastic, and chemicals.

• Combustible Dust – Determined by sample testing to ASTM E 1226 - Combustible Dust Cloud Explosibility Testing
Class II Areas

NFPA 499 Definition:

*Areas that are hazardous because of the presence of combustible dust*

- Combustible dust may be ignitable either in the form of a dust cloud or as a layer of dust on the surface
Class II Areas

Typical signs of areas to be evaluated:

– Dust accumulations are known to occur on equipment
– Dust clouds are known to obscure visibility
– Past dust fires have been ignited by equipment
– Elevated areas where smaller particles can accumulate and dry
– Rooms containing particle size reduction equipment
– Rooms storing wood waste (silos)
Dust Layers and Area Classification

NFPA 499

Table A.6.3.2(a) Division Determination Guidelines Based on Dust Layer Thickness

<table>
<thead>
<tr>
<th>Thickness of Dust Layer</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;3.0 mm (¼ in.)</td>
<td>Division 1</td>
</tr>
<tr>
<td>&lt;3.0 mm (¼ in.), but surface color not discernible</td>
<td>Division 2</td>
</tr>
<tr>
<td>Surface color discernible under the dust layer</td>
<td>Unclassified</td>
</tr>
</tbody>
</table>
Area Classification Class II Example

NFPA 499

FIGURE 6.10(a)  Group F or Group G Dust — Indoor; Unrestricted Area; Open or Semi-Enclosed Operating Equipment.

FIGURE 6.10(b)  Group E Dust — Indoor, Unrestricted Area; Open or Semi-Enclosed Operating Equipment.
Particle Size Reduction

NFPA 664 provides guidance for classification in rooms containing particle size reduction equipment

- This machinery cuts, shears, brakes, or pulverizes wood fractions into smaller pieces

- Examples are hoggers, chippers, refiners, hammermills

- By default, these areas are hazardous, and the thickness of dust accumulation defines the Division
Waste Storage Areas

- NFPA 664 provides guidance for classification in rooms handling wood waste
- Examples are hoppers, dust silos, reclaim pits
- By default, these areas are hazardous and the Division is based on moisture content
- BCSA does not recommend using moisture to determine the Division as green wood dries, and for small particle size, even wet wood is explosive
What is Required in British Columbia?

The codes and regulations in force in British Columbia have requirements to mitigate the risks associated with combustible dust.

The next 4 slides show some of the key regulatory reference material in relation to electrical and gas equipment in areas that may become hazardous due to the presence of combustible dust.
Existing Codes and Standards

Dust Explosion Prevention

2. Hazardous Locations sections (4.9 and 4.7) of B149.1 and B149.2
4. NFPA 499 Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations...
5. IEC 60079-10-2 Classification of Areas – Combustible Dust Atmospheres
7. OSHA 3371-08 Hazard Communication Guidance for Combustible Dusts
8. NFPA 654, 68, 61, 77…
Canadian Electrical Code
Section 18 – Hazardous Locations

• Speaks to BC Law adopting this as the definition of hazardous locations. It is essentially the same as the NFPA material.

• Classification is based on electrical code, but applies to gas code also. (slide coming)

• Section 18 also speaks to equipment installation within hazardous areas
# Canadian Electrical Code

## Section 18 – Hazardous Locations

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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zone 0</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Division 1</th>
<th>Division 2</th>
<th>Division 1</th>
<th>Division 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosive gas atmospheres continuously present or present for long periods of time</td>
<td>Explosive atmospheres likely to occur in normal operation or adjacent to a Zone 0 location</td>
<td>Explosive atmospheres not likely to occur during normal operation or if so, for a short duration only or adjacent to Zone 1 location</td>
<td>Continuous, intermittent or periodic explosive dust atmosphere during normal operation</td>
<td>Infrequent explosive combustible dust atmospheres due to operational malfunctions</td>
<td>Readily ignitable fibres or materials producing combustible flyings are handled, manufactured or used</td>
<td>Readily ignitable fibres other than those in process manufacture are stored or handled</td>
</tr>
</tbody>
</table>

### Equipment
- Marking
- Temperature
- Non-essential electrical equipment
- Rooms, sections or areas
- Equipment rooms
- Metal covered cable
- Pressurized equipment or rooms
- Intrinsically safe and non-incendive
- Cable trays
- Combustible gas detection
- Flammable fluid seals
- Bonding in hazardous locations

### Conductor insulation
- Meters, instruments, and relays
- Wiring methods
- Sealing
- Switches, motor controllers, cbs and fuses
- Control transformers and resistors
- Motors and generators
- Luminaries
- Utilisation equipment, fixed and portable
- Flexible cords
- Receptacles and attachment plugs
- Conductor insulation
- Signal, alarm, RC nd comms systems
- Live parts
- Ventilation pipes
- Electric cranes, hoists and similar equip.
- Storage battery charging equipment

### General technical installation and maintenance requirements

Specific zone/division installation requirements have similar intentions:
- Ensure equipment is suitable for potential environments
- Provide suitable separation between equipment and atmosphere
  - Release of heat energy
  - Seal from ingress of ignitable gas/material
- Minimize impact of failures and malfunctions.
Natural Gas and Propane Codes
B149.1 and B149.2

Hazardous locations

An appliance, unless certified for installation in a hazardous location, shall not be installed in any location where a flammable vapour, combustible dust or fibres, or an explosive mixture is present.

**B149.1 Handbook** refers to NFPA 499 for classification of areas.

**Guide for Equipment Certification Requirements for Hazardous Location**
Mitigation and Classification

• BCSA recognizes that the most effective method to reduce the risk of dust fires and explosions is to remove the fuel at the source.

• BCSA recognizes that removal of wood dust fuel at the source to prevent accumulation of 1/8 inch layers may not be achievable in all locations.
Housekeeping

BCSA recognizes that some operators may choose to employ housekeeping techniques to:

– Substantiate an unclassified location

– Manage a location classified as Division I or II per the Safety Order
Housekeeping

- BCSA expects to find accumulations of wood dust maintained below the NFPA specified levels (1/8 inch) where equipment has not been approved for use within the hazardous location.

- Management of dust levels doesn’t change the area classification. The need to manage the dust level is of itself an indication that there is a hazardous location.

- NFPA 499 provides recommended housekeeping frequencies
### Table A.6.7 Recommended Frequency of Housekeeping

<table>
<thead>
<tr>
<th>Depth of Dust Accumulation on Equipment (1)</th>
<th>Area Classification (2)</th>
<th>Release Frequency (3)</th>
<th>Housekeeping Activity (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible, up to &lt;1 mm (1/32 in.)</td>
<td>Unclassified</td>
<td>Infrequent</td>
<td>Clean as appropriate</td>
</tr>
<tr>
<td>Up to 3 mm (1/8 in.)</td>
<td>Class II, Division 2</td>
<td>Infrequent</td>
<td>Clean as necessary to maintain less than 3 mm (1/8 in.)</td>
</tr>
<tr>
<td>Up to 3 mm (1/8 in.) or occasional cloud formation</td>
<td>Class II, Division 1 or Division 2</td>
<td>Occasional</td>
<td>Clean at frequency appropriate to minimize additional dust accumulations or formation of a cloud</td>
</tr>
<tr>
<td>&gt;3 mm (1/8 in.) to layer test value, or presence of dust cloud</td>
<td>Class II, Division 1</td>
<td>Continuous/frequently</td>
<td>Clean at frequency appropriate to minimize additional dust accumulations</td>
</tr>
<tr>
<td>Exceeds layer test value, or presence of extensive dust cloud</td>
<td>Class II, Division 1</td>
<td>Infrequent</td>
<td>Immediately shut down and clean equipment</td>
</tr>
</tbody>
</table>
Observed Sawmill Conditions

Is this a classified ‘hazardous location’?

Is combustible dust likely in the atmosphere during operation?
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 2 – Hazardous Location

Combustible dust accumulations on, in, or in the vicinity of electrical equipment that interferes with heat dissipation or may be ignited by equipment operation or failure
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 2 – Hazardous Location

Combustible dust accumulations on, in, or in the vicinity of electrical equipment that interferes with heat dissipation or may be ignited by equipment operation or failure
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 2 – Hazardous Location

Combustible dust accumulations on, in, or in the vicinity of electrical equipment that interferes with heat dissipation or may be ignited by equipment operation or failure
Observed Sawmill Conditions

Section 18 of CEC, Part 1  
Class II, Division 2 –  
Hazardous Location

Combustible dust accumulations on, in, or in the vicinity of electrical equipment that interferes with heat dissipation or may be ignited by equipment operation or failure
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 2 – Hazardous Location

Combustible dust accumulations on, in, or in the vicinity of electrical equipment that interferes with heat dissipation or may be ignited by equipment operation or failure
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 1 – Hazardous Location

Continuous, intermittent or periodic explosive dust atmosphere during normal operation.

Abnormal operation or failure of equipment might cause an explosive dust atmosphere and produce a source of ignition.
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 2 – Hazardous Location

Combustible dust accumulations on, in, or in the vicinity of electrical equipment that interferes with heat dissipation or may be ignited by equipment operation or failure
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 2 – Hazardous Location

Combustible dust accumulations on, in, or in the vicinity of electrical equipment that interferes with heat dissipation or may be ignited by equipment operation or failure
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 1 – Hazardous Location

Continuous, intermittent or periodic explosive dust atmosphere during normal operation.

Abnormal operation or failure of equipment might cause an explosive dust atmosphere and produce a source of ignition.
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 1 – Hazardous Location

Continuous, intermittent or periodic explosive dust atmosphere during normal operation.

Abnormal operation or failure of equipment might cause an explosive dust atmosphere and produce a source of ignition.
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 1 – Hazardous Location

Continuous, intermittent or periodic explosive dust atmosphere during normal operation.

Abnormal operation or failure of equipment might cause an explosive dust atmosphere and produce a source of ignition.
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 2 – Hazardous Location

Combustible dust accumulations on, in, or in the vicinity of electrical equipment that interferes with heat dissipation or may be ignited by equipment operation or failure. ODP style motors are particularly susceptible to dust accumulation internally.
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 2 – Hazardous Location

Combustible dust accumulations on, in, or in the vicinity of electrical equipment that interferes with heat dissipation or may be ignited by equipment operation or failure
Observed Sawmill Conditions

Section 18 of CEC, Part 1
Class II, Division 1 – Hazardous Location

Continuous, intermittent or periodic explosive dust atmosphere during normal operation.

Abnormal operation or failure of equipment might cause an explosive dust atmosphere and produce a source of ignition.
Observed Sawmill Conditions

Water Spray in use to help reduce the spread of dry, air borne dust.
Observed Sawmill Conditions

Water Fog
Device in use to help reduce the spread of dry, air borne dust.
Observed Sawmill Conditions

• Metal halide and high pressure sodium bulbs have surface temperature ratings up to 500 deg C

• Ballasts have temperature ratings up to 250 deg C
Observed Sawmill Conditions

Combustible dust? – Did housekeeping miss this portion? How did it get there?

What is the operating temperature of this gas-fired radiant heater? Is it suitable for use where combustible dust accumulates on the deflector?
Observed Sawmill Conditions

Is this IR Heater classified for use in a Hazardous Location?
Observed Sawmill Conditions

IEC 60079-10-2 Annex C

Risks presented by dust layers:

1. Primary explosion can raise dust into clouds, causing more damaging secondary explosions.

2. Ignition from heat flux which may be a slow process.

3. Dust layers can be raised into clouds and contact ignition sources.
Observed Sawmill Conditions

Housekeeping:

**Good**
Dust layers are kept to negligible thickness, or are non-existent.

**Fair**
Dust layers are not negligible but are short-lived (less than one shift). The dust is removed before any fire can start.

**Poor**
Dust layers are not negligible and persist for more than one shift.
Hazard Mitigation

• Dust control
• Ignition source control
• Explosion Prevention
Dust Control

• Design of facility & process equipment

• Contain combustible dust
  – Extraction

• Clean fugitive dust
  – Regular program
  – Access to hidden and overhead areas
  – Safe cleaning methods
Ignition Source Control

- Electrical equipment
- Static electricity control
- Mechanical sparks & friction
- Open flame control
- Design of heating systems & heated surfaces
- Use of tools & vehicles
Explosion Mitigation

Techniques to minimize the impact of dust explosions require experts - engineers and manufacturers who specialize in these systems such as:

• Deflagration Venting
• Deflagration Pressure Containment
• Deflagration Suppression Systems
• Isolation of equipment
Actions Required by BCSA from the Incidents

3 safety orders have been issued


2. SO EL-2012-03 – Issued Sept 18, 2012 – Electrical Equipment Located in Wood Pellet Manufacturing Plants


Safety order #1 and 2 – ensure covers in place, ventilation maintained etc. – preliminary actions while investigation was still occurring

Safety order #3 (current) issued to cover recommendations from the incident investigations
BCSA Recommendations from Mill Explosion Investigations

To Owners and Operators of Wood Processing Facilities:

Recommendation #1:

Document a facility assessment to identify hazardous locations that is completed:

• by a professional that is qualified to identify combustible dust hazardous locations, and

• in accordance with a recognized industry standard for combustible dust hazardous locations.
BCSA Recommendations from Mill Explosion Investigations

To Owners and Operators of Wood Processing Facilities:

Recommendation #2:

Where hazardous locations are identified and contain regulated equipment, document a plan to either:

- develop and implement auditable wood dust management practices for these locations that are accepted by a qualified person as an effective means to manage the combustion hazard, or
- configure the equipment for safe operation given the presence of the combustible dust hazard. Safe operating configurations include:
  a) obtaining approval for operation in the hazardous location, or
  b) permanent removal of the equipment from the hazardous location.
BCSA Recommendations from Mill Explosion Investigations

To Owners and Operators of Wood Processing Facilities:

Recommendation #3:

Incorporate any identified hazardous locations and the chosen means to manage the combustion hazards into the facility’s Fire Safety Plan, or other suitable facility document(s).

Note: Recommendations 4, 5 and 6 were made to the BC Office of the Fire Commissioner and recommendations 7, 8, and 9 were made to the Canadian Standards Association that mirror and support the above three recommendations.
Safety Order SO-EL/GA 2013-02
Combustible Dust Hazard in Wood Processing Facilities

1. Conduct a facility assessment to identify hazardous locations due to combustible dust presence:
   a. By a qualified person
   b. In accordance with a recognized standard
   c. Document assessment process
2. Where equipment is located within a hazardous location:

   a. Configure the equipment for safe operation in the presence of the hazard:
      i. Permanent removal of equipment from the location
      ii. Replace existing equipment with suitable equipment for hazardous environment
      iii. Modify existing equipment for approved operation suitable for hazardous environment

   b. Manage the dust hazard to minimize the risk.
Safety Order SO-EL/GA 2013-02
Combustible Dust Hazard in Wood Processing Facilities

3. Record facility hazardous locations and means to manage combustion hazards in suitable facility document

4. Implement periodic re-evaluation of the hazardous location assessment, hazard management practices for currency and effectiveness
Next Steps

• Carry out a survey of your facility to identify hazardous areas

• Develop a dust management plan to mitigate the risks associated with the identified hazard
  
  – Housekeeping strategies to reduce the risk may be utilized for existing installations only. Replacement or repair of equipment in those areas may be done in kind, but any upgrades or new installations must be compliant with the requirements for equipment installed within the hazardous area.
Next Steps

• Document the above classification and plan

• Implement a management of change process to ensure the currency of the plan
  – Review the plan at least once every 5 years, even if no changes have been made to the operation.

• Implement an audit and inspection process that to verify the effectiveness of your plan
For More Information

BC Safety Authority

Phone: 1-866-566-7233

Email: info@safetyauthority.ca

www.safetyauthority.ca