



Labour

HAZARD ALERT

Cleaning a Grain Elevator

Background

Grain elevators are used to receive, clean, store, and transfer bulk grain. The flow of grain and its processing through the facility cause grain dust to become airborne in the work environment. Some activities can create enough grain dust that it becomes an explosion hazard or can make employees sick. Cleaning of a grain elevator is one such process that can cause a significant increase in the amount of grain dust in the air, if done without adequate precautions. If a lot of grain dust is suspended in the air, and a spark or flame is present, an explosion may occur. A grain dust explosion can be powerful enough to destroy a grain elevator and to potentially cause severe injuries to employees.

The concentration of grain dust in work place air must always be less than 50% of the lowest level that will cause an explosion (the Lower Explosive Limit or LEL) in areas where there are no sources of ignition. It must be lower than 10% of the LEL where there is a source of ignition. (A few examples of ignition sources include: electrical spark, smoking, unsafe lighting). The LEL varies between 20 g/m³ to 60 g/m³ depending on the type of grain, the particle size, and the moisture content of the dust. Dust at those levels is very “thick” and hard to see through and can occur in small areas during some cleaning processes.

Grain dust can also be harmful to health. Health effects of occupational exposure to grain dust include eye, skin, upper respiratory tract irritation; chronic bronchitis; and asthma. These health effects have been reported by people working in concentrations of less than 10 mg/m³.

Furthermore, conducting certain operations while cleaning a grain elevator or its grain bins may place workers in situations where a serious injury or fatality could occur; for example, falls while working at heights, confined space hazards when entering a grain bin or silo, and coming into contact with moving machinery while working near equipment moving grain or flour.

Hazards

Factors that can lead to an accident, death, or illness from cleaning a grain elevator include:

- the generation of dust to concentrations above the LEL;
- oxygen deficiency or other hazardous atmosphere in a grain bin, silo, pit or other confined space;
- working at heights;
- working near unguarded moving parts such as conveyors or augers; and
- breathing air that contains high concentrations of grain dust.

Eliminating and Controlling the Hazard

Some effective ways to reduce hazards when cleaning a grain elevator include:

- establishing and monitoring confined space entry procedures;
- establishing safe work procedures for cleaning a grain elevator (e.g.: lockout/tagout procedures, use of vacuums or brushes in place of blow down);

- training employees on the hazards and how to protect themselves using safe work procedures;
- providing personal protective equipment (PPE) for hazards that cannot otherwise be controlled; and
- ensuring employees follow safe work procedures and use proper safety devices and personal protective equipment.

The most effective way to prevent grain elevator fires and explosions is to actively prevent the conditions where an explosion could occur. This includes:

- controlling settled dust to less than 3 mm by regularly vacuuming surfaces;
- controlling the release of dust by sealing grain transferring systems, using local ventilation and dust collection systems at transfer points; and
- prohibiting the use of compressed air to blow settled material from surfaces.

In addition, some ways to reduce the risk of ignition include only using intrinsically safe tools and equipment (tools that do not create sparks) and establishing safe work procedures for conducting hot work like welding or metal cutting.

Regulatory Requirements

The Canada Occupational Health and Safety Regulations (COHSR), Part II entitled “Permanent Structures” contains requirements relating to grain elevators such as in section 2.14(2) “Housekeeping and Maintenance”. It says that dust, dirt, waste and scrap material in every work place in a building shall be removed as often as is necessary to protect the health and safety of employees.

The COHSR, Part VIII entitled “Electrical Safety” contains requirements relating to the use of intrinsically safe electrical tools and equipment as well as other safety requirements for electrical equipment.

The COHSR Part XIII entitled “Tools and Machinery” sets out requirements for spark proof tools (section 13.2) and for intrinsically safe portable power tools (section 13.5) in areas where fires or explosions could occur.

The COHSR, Part X entitled “Hazardous Substances” contains section 10.4 “Hazard Investigation” that prescribes requirements for conducting a hazard investigation for exposure to grain dust. As well, section 10.14 “Employee Education” describes required aspects of an employee education program for occupational hazards. Sections 10.19 to 10.22 “Control of Hazards” contain requirements for grain dust concentrations in air relative to the LEL and state that compressed air shall not be used for blowing dust from structures, machinery or materials. Compressed air shall not be misused.

The COHSR, Part XI entitled “Confined Spaces” stipulates requirements in respect of grain elevators and grain bins, such as hazard assessment, confined space entry procedures, emergency procedures and equipment, and hot work. It also specifically addresses engulfment issues where solids are capable of flowing easily, such as bulk grain.

The COHSR, Part XII entitled “Safety Materials, Equipment, Devices and Clothing” contains requirements for the use of personal protective equipment (PPE) to protect employees from exposure to grain dust. The use of respiratory PPE must especially be considered for operations where excessive grain dust disturbance occurs, such as during the cleaning process. As well, section 12.10 “Fall-Protection Systems” states requirements for fall-protection systems that must be properly used when working at heights or over surfaces or things that can cause injuries.

Other hazards related to cleaning operations must be identified, assessed and be controlled by preventive measures as prescribed by COHSR, Part XIX “Hazard Prevention Program”.

Additional Resources:

For further information, please contact the ESDC Labour Program office at 1-800-641-4049. The Labour Program website provides information on occupational health and safety topics such as: Right to Know, Right to refuse dangerous work, and Workplace Health and Safety Committees.

The Canadian Centre for Occupational Health and Safety provides more information on combustible dust hazards on its website.
