



Occupational Exposure Limit (OEL) for Flour Dust

**Requirements and
Recommended Best
Practices for Minimizing
Employee Exposure to
Flour Dust and Grain Dust
in Flour Mills in Canada**

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and Recommended Best Practices for Minimizing Employee Exposure to Flour
Dust and Grain Dust in Flour Mills in Canada**

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**Pursuant to Part X, Hazardous Substances
Canada Occupational Health and Safety Regulations
Part II, *Canada Labour Code***

Prepared by

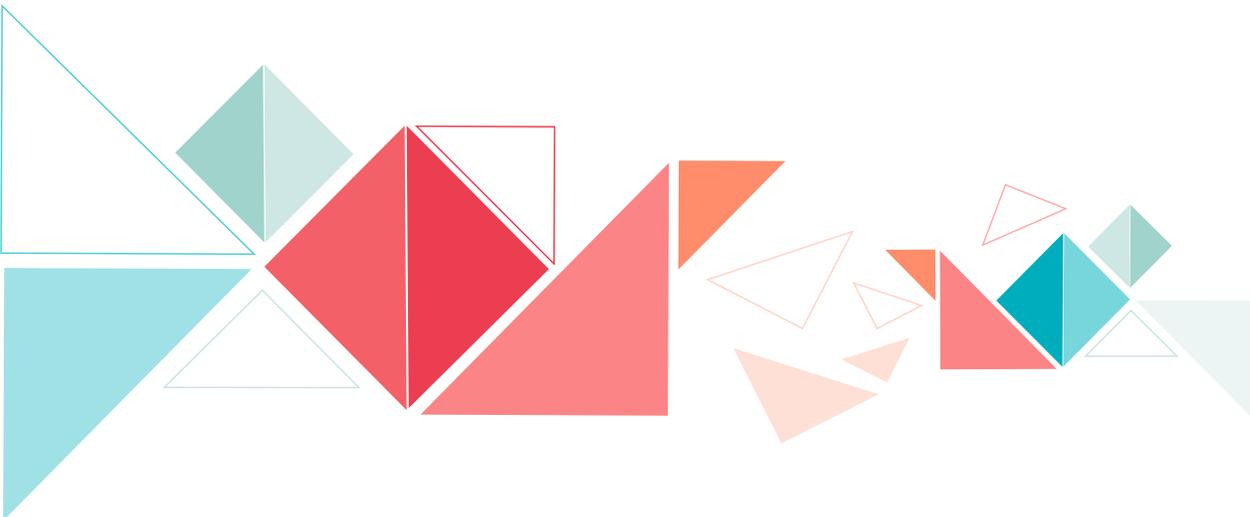
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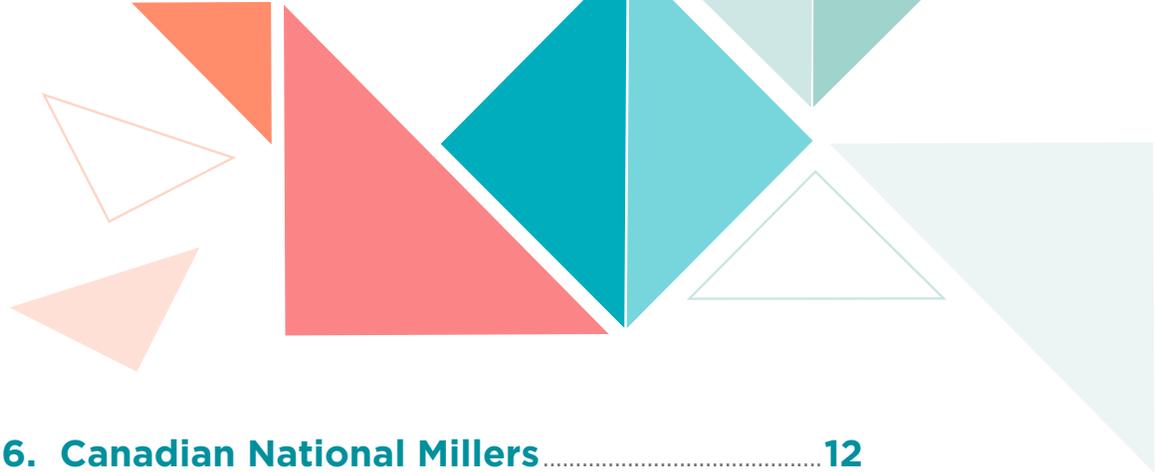
In consultation with

Canadian National Millers Association

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1. Introduction

Exposure monitoring of occupational exposure to inhalable flour dust was carried out by the Labour Program from June to December 2000. A total of 157 personal samples were collected from 14 flour mills in Canada and analyzed for inhalable flour dust. The levels of inhalable flour dust were compared with the present Threshold Limit Value-Time Weighted Average (TLV-TWA) of 0.5 mg/m³ adopted by the American Conference of Governmental Industrial Hygienists (ACGIH[®])² in 2001. Before 2001, flour dust was considered as Particles (insoluble or poorly soluble) Not Otherwise Specified (PNOS) with a recommended level of 10 mg/m³ until such time as a TLV[®] is set for flour dust.

The results indicated 97.1% non-compliance with the TLV[®] of 0.5 mg/m³. In addition, 32.7% (34 employees) of the flour mill employees were found to be exposed to levels below 5 mg/m³ and 42.3% (44 employees) above 10 mg/m³. These results were based on 8-hour exposure to inhalable flour dust. These findings were comparable with the results of the follow-up studies/surveys conducted for the Canadian National Millers Association by Pinchin Ltd. in 2002 and 2007.

Based on the results of the study^{1,3} conducted by the Labour Program and of those conducted by and for the CNMA, the Labour Program concluded that the TLV[®] of 0.5 mg/m³ was not practically achievable under normal operations of wheat flour milling establishments. Compliance with 0.5 mg/m³ was not achievable through engineering controls and would require continuous use of respiratory protective equipment by all production employees at all times. The previous level of 10 mg/m³ was unacceptable because it did not address all health effects of employees exposed to flour dust on a daily basis. Moreover, it was demonstrated through the Labour Program and industry monitoring that engineering controls could reduce employee exposure for some categories of production employees significantly below 10 mg/m³. Consequently, the Labour Program concluded that an occupational exposure limit of 3 mg/m³ was an appropriate compromise as it takes into account the health effects including respiratory sensitization, and the apparent limits of engineering controls. With proper cleaning procedures in place and selective use of appropriate personal protective equipment, employers should be able to ensure employee health and safety.

2. Potential Health Effects Associated with Employee Exposure to Flour and Grain Dust

As per the ACGIH[®] definition, flour is a complex organic dust consisting of wheat, rye, millet, barley, oats, or corn cereals, or are combination of these, which has been processed or ground by milling.

The ACGIH[®] criteria document (2000), based on which the TLV[®] of 0.5 mg/m³ for flour dust was established, provided the scientific data from 76 papers published over two decades in internationally recognized scientific journals, books and reports. It should be noted that none of the published studies were conducted on Canadian flour milling industry employees. Most of these papers related to occupational exposure in flour milling industry worldwide and are described in the report published in 2001 on *Exposure to Inhalable Flour Dust in Canadian Flour Mills*¹ by Eva Karpinski. The literature review in 2011 conducted by the Labour Program did not provide any new scientific data on health effects resulting from exposure to flour dust.

The available data indicate that, for some employees, flour dust can induce allergic reactions, as well as, be the primary cause or a contributing factor in chronic respiratory disorders, including asthma. The relationship between occupational exposure to flour dust and respiratory, skin and eye symptoms, and allergic sensitization has also been examined. For epidemiological studies focusing on exposure-response relationships, personal exposure to inhalable flour dust, wheat allergens and α -amylase allergens in flour mills and bakeries has been assessed by several authors. The majority of published studies pertain to bakery employees as opposed to grain milling production employees. Cereal antigens and enzymes used in the flour industry, especially α -amylase are considered to be main causes of respiratory sensitization and occupational asthma among both milling and bakery employees. However, the reported incidence is much higher among bakery employees.

In general, changes in lung function, increased prevalence of chronic bronchitis and work-related respiratory and asthmatic symptoms at inhalable (total) dust levels of approximately 1.5 to 4 mg/m³ have been reported. Data indicating wheat flour sensitization following inhalation exposures as low as 0.5 mg/m³ flour dust provides additional evidence of respiratory sensitization health effect. In summary, the following adverse health effects are associated with employee exposure to flour dust:

- ▶ Bronchitis;
- ▶ Upper respiratory tract irritation;
- ▶ Asthma;
- ▶ Respiratory sensitization (RSEN); and
- ▶ Skin and eye irritation.

There are insufficient data to warrant a notation of dermal sensitization (DSEN) arising from employee exposure to flour dust.

Similarly, the body of published studies reveals that employee exposure to elevated concentrations of airborne grain dust may cause a range of health effects, most of which involve the pulmonary system. In summary, the following adverse health effects are considered to be associated with unprotected employee exposure to grain dust:

- ▶ Bronchitis;
- ▶ Upper respiratory tract irritation;
- ▶ Asthma; and
- ▶ Decline in pulmonary function.

Based on some studies, grain handling employees have also been reported to show non-pulmonary effects such as rhinitis, **conjunctivitis**, grain fever, and **dermatitis**.

3. Legislative Requirements

3.1 Federally Regulated Industries subject to the ***Canada Occupational Health and Safety Regulations***⁴(COHSR)

The COHSR apply to all federally regulated work places. Among these are grain handling facilities that include grain processing establishments defined under Section 2.1 of the Canada Occupational Health and Safety Regulations as follows:

*“grain-handling facility” means a structure that is constructed, installed or established to handle, store or process grain or grain products, and includes an elevator as defined in section 2 of the **Canada Grain Act**.⁵ (installation de manutention des grains)*

Primary processing of grain (milling) is therefore subject to the COHSR.

3.2 Purpose of Part II ***Canada Labour Code***⁶(Code) and the COHSR

The Canada Occupational Health and Safety Regulations are made pursuant to Part II of the *Canada Labour Code*. Section 122 of the Code states:

122.1 The purpose of this Part is to prevent accidents and injury to health arising out of, linked with or occurring in the course of employment to which this Part applies.

122.2 Preventive measures should consist first of the elimination of hazards, then the reduction of hazards and finally, the provision of personal protective equipment, clothing, devices or materials, all with the goal of ensuring the health and safety of employees.

3.3 Canada Occupational Health and Safety Regulations

The COHSR further interpret Part II of the Code, Occupational Health and Safety.

Section 10.19 of Part X of the COHSR stipulates that:

10.19 (1) An employee shall be kept free from exposure to a concentration of

- (a)** *an airborne chemical agent, other than grain dust or flour dust, in excess of the value for that chemical agent adopted by the American Conference of Governmental Industrial Hygienists, in its publication entitled Threshold Limit Values and Biological Exposure Indices, as amended from time to time;*
- (b)** *(i) airborne grain dust in excess of 4 mg/m³;
(ii) airborne flour dust in excess of 3 mg/m³;*

4. Sources of Grain and Flour Dust in Flour Mills in Canada

4.1 Sources of Flour Dust in a Flour Mill

The ACGIH® defines flour as a complex organic dust consisting of wheat, rye, millet, barley, oats, or corn cereal, or a combination of these, which have been processed or ground by milling.

Flour dust is a consequence of the fractionation of grain kernels (breaks) and separation of particle sizes (sifting and purifying) into product streams that may be segregated or blended as finished milled grain products. Although most fractionation, particle separation and blending equipment is operated under negative pressure (aspiration and dust collection), quantities of flour dust can escape the processing stream into the milling facility air and are easily suspended at times due to small particle size.

High concentrations of inhalable flour dust can also become dispersed into the air mass as a consequence of milling and/or conveying equipment blockages (chokes) that if undetected by control system sensors and/or unnoticed by milling personnel for even a short period of time, can spill out of equipment onto mill floors and other surfaces. Removal of chokes resulting in such spillages is typically a job that is completed manually by first shutting down the milling equipment, disassembling equipment, conveyors or distribution ducts and removing the blocked product stream by hand. The clean-up of spillage onto mill floors can be completed following removal of the chokes.

Quantities of flour dust are also released into the air mass within grain milling facilities during cleaning and maintenance of milling equipment and dust collection equipment. The latter is particularly problematic in that the filters in some designs of dust collection equipment must be completely removed, cleaned and/or replaced regularly (as per site-specific maintenance requirements) in order to maintain optimal dust collection capacity of the equipment. This also is a manual task.

A fourth source of flour dust in grain milling facilities is the packing operations, where milled grain products are packaged through semi-automated and automated gravity and pneumatic bag filling and sealing systems. Packing lines require a moderate amount of manual labour and operating supervision, placing employees in close proximity to flour dust that is not fully contained within the bagging system, despite shielding and dust collection through local ventilation.

4.2 Source of Grain Dust in a Flour Mill

While flour dust is considered to be particulate matter generated in the process of grinding whole grain and separation into various fractions of whole grain kernels bearing different nutritional properties and further processing end use performance, grain dust can generally be considered to be mostly particulate matter that accompanies unprocessed grain into mills.

Grain dust is present on the surface of grain kernels and in the dockage within lots (loads) of grain delivered to grain milling facilities. Dockage is defined pursuant to the *Canada Grain Act* as “any material intermixed with a parcel of grain, other than kernels of grain of a standard of quality fixed by or under this Act for a grade of that grain that must and can be separated from the parcel of grain before that grade can be assigned to the grain.” Dockage can and does include foreign matter other than organic (plant) materials such as stones, soil and small particulate matter that becomes co-mingled (mixed) with grain during harvest, storage and transportation.

Accordingly, the composition of grain dust varies by grain class (as defined by regulation and grading standards), growing and climatic conditions, region of origin and degree of handling and cleaning prior to delivery to the milling facility.

Grain dust is removed from whole grain kernels prior to the milling process through a series of steps that combined are referred to as grain cleaning. In the majority of flour mills in Canada, the grain cleaning equipment infrastructure and activity occurs in the grain milling facility within air space (building structure) that is contiguous with the grain milling equipment infrastructure and process. Although the majority of grain cleaning equipment, machinery and conveyors are operated under negative air pressure (aspiration and dust collection), some grain dust can and does escape from the grain cleaning and related conveying equipment and therefore, can be found within the flour mill's air space.

Sections 5 and 6 are written to the extent possible so as to identify how recommended best practices in milling workplaces can assist in meeting the regulatory requirements and intent of the COHSR.

5. Preventive Measure Requirements under the COHSR

Section 19.5 of the COHSR stipulates that:

19.5 (1) The employer shall, in order to address identified and assessed hazards, including ergonomics-related hazards, take preventive measures to address the assessed hazard in the following order of priority:

- (a) the elimination of the hazard, including by way of engineering controls which may involve mechanical aids, equipment design or redesign that take into account the physical attributes of the employee;*
- (b) the reduction of the hazard, including isolating it;*
- (c) the provision of personal protective equipment, clothing, devices or materials; and*
- (d) administrative procedures, such as the management of hazard exposure and recovery periods and the management of work patterns and methods.*

The Labour Program has published some general control measures and best work practices for federally regulated grain elevators and flour mills, based on which the employers must, for the purpose of implementation, develop written programs of work practices, including procedures that will help minimize grain dust and flour dust exposures to ensure health and safety of their employees. They can be found under Workplace Hazard Alerts as following Labour Program website reports and publications:

- ▶ **Flour dust – General information sheet**⁷
- ▶ **Grain dust – General information sheet**⁸
- ▶ **www.canada.ca/en/employment-social-development/services/health-safety/reports.html**^{7,8}

The general control measures and best work practices for flour dust are as follows:

Ventilation including dust collection systems

1. **Dust collectors** that allow the least possible amount of dust to escape are optimum. Dust collectors can operate at efficiencies in excess of 99%. Collector's inefficiency is a result of by-pass due to damaged filter, faulty seals or sheet metal leaks. An Official delegated by the Minister of Labour (ODM) upon attending a flour mill for an inspection or other intervention may ask for the most recent results of equipment inspection for mechanical leaks, the system's maintenance schedule and cleaning and maintenance procedures.
2. The location of **exhaust stacks** with respect to air intake or building openings must prevent cross contamination. It is important that the fans used for ventilation do not recirculate dust back into the building and contribute to the ambient levels of airborne flour dust.

3. **Make up air** needs to be provided for the packers. For a ventilation system to operate effectively, air must be supplied to replace the air that draws away the dust. The make-up air inlets should be located away from the dust sources. It is also possible that the exhaust air be re-circulated after thorough cleaning. The employer should consider technical materials such as the ACGIH® *Industrial Ventilation A Manual of Recommended Practice*⁹ as a guide in selecting the type of dust collector and the air filtration system.

Equipment

4. **Packing machines.** The machines' inefficiencies are usually a result of by-pass due to faulty seals, less than ideal design and/or poor maintenance. The ODM may ask for the equipment's maintenance schedule and cleaning/equipment reconditioning procedures. If technically feasible, options to modify the packing lines with additional dust collection or ventilation (make-up air) may be discussed.

Work Practices in Flour Mills

All federally regulated flour mills in Canada have ongoing programs of mill sanitation. These are designed and carried out with several purposes. These are not limited to occupational health and safety but also include:

- Basic food safety requirements to minimize risk of contamination of the food portions of milled grain products;
 - Removal of harborage (living space) and food sources of insect stored product pests such as grain and flour beetles (also a food safety measure); and
 - Reduction of risk of fire and explosion.
5. **Compressed air** to remove dust from equipment and structural surfaces must not be used where there is a risk of any person being directly exposed to the jet or where a fire, explosion, injury or health hazard is likely to result from such use; or such use would result in a concentration of an airborne hazardous substance in excess of the values referred to in the Hazardous Substances of the COHSR (10.21(1)(a) and (b)).

Note 1: Removing settled dust with compressed air can cause extreme acute exposures to dust.

Work practice controls for the flour industry include procedures that help minimize flour dust exposure. "Blow down" procedures as they are called, are only allowed when vacuum cleaning or sweeping is not practical and only under strictly observed conditions. Reference should be made to subsection 6.3 Use of Compressed Air of this guideline, provided by the industry as a part of their Guidance on Control Measures and Best Work Practices.

Note 2: Very high airborne concentrations can also introduce the risk of explosion.

6. A **vacuum system** and sweeping are the preferred means of removing settled/accumulated dust layers during normal operations of a flour mill. The ODM may ask to review the vacuum system in place and its maintenance schedule.

Personal Protective Equipment

7. **Respiratory protection will be required in some circumstances.** With regard to the type of respirator used, the selection should be based on the maximum concentrations encountered. Complete respiratory protection training including selection, fit testing, maintenance and inspection must be provided to all employees who are exposed to the concentration levels above the prescribed occupational exposure limit. Reference must be made to the CSA Standard Z94.4, "Selection, care and use of respirators",¹⁰ as amended from time to time. The ODM may check whether a respiratory protection program is in place including employee training and fit testing performed on a regular basis, as per the Standard requirements. Fit testing includes assuring that facial hair does not impede the proper fit of respiratory protective equipment.

Note: Respirators should only be used when engineering controls are not reasonably practicable, e.g., during cleaning/maintenance procedures or emergencies.

8. **Protective clothing** to reduce dermal exposure such as gloves and coveralls should also be provided to employees undertaking usual assigned tasks where such tasks are likely to result in frequent contact with settled or accumulated dust.

Medical Surveillance

Medical surveillance of flour milling production employees is not a requirement of the COHSR. However, where symptoms of adverse health outcomes are present in individual employees, the ODM may recommend/ask the employer to consider a **medical surveillance** program that includes medical examinations, clinical tests, action levels, health education and record keeping for such employees and where warranted, the assignment of alternative tasks that imply lower exposure to flour dust and/or grain dust. The medical surveillance should include the respiratory tract, skin and immunological sensitization and the affected employees' ability to use respiratory protection equipment.

6. Canadian National Millers Association's Guidance on Control Measures and Best Work Practices

The following are the control measures and best work practices for minimizing employee exposure to airborne dust in an operating environment, developed by the flour milling industry based on the Labour Program's requirements and recommendations, as indicated above.

6.1 Grain Handling and Milling Equipment Maintenance and Operation

Flour mills ensure that all grain handling, cleaning and milling equipment is maintained and operated in a manner so as to minimize release of grain dust and flour dust into the milling facility work environment. The essential measures include:

- ▶ Except where equipment is deliberately designed to operate under negative pressure and to draw air into the product streams and except where it is essential to access and physically sample grain and milled product streams, equipment doors and access points shall remain closed at all times during normal operation;
- ▶ Gaskets, seams and joints of equipment shall be maintained in a manner that optimally minimizes potential escape of flour dust;
- ▶ Monitoring of plug sensors and other indicators as a means of early detection of the onset of an abnormal upset condition;
- ▶ Dust collection systems are to be inspected and maintained on a schedule that ensures their proper operation; and
- ▶ Having in place a documented protocol for the clean-up of chokes, spills and leaks is highly important as these manual cleaning tasks can contribute significantly to the exposure of employees directly involved and to the further release into the flour mill environment of airborne particulate.

Note: Milling units (processing equipment) within milling establishments are typically equipped with dust collection systems that capture airborne fine particulate matter (flour dust) at various locations within the units. However, the design standard (manufacturer's intended performance level) for bag houses of dust collection systems that discharge into mill air space is typically well in excess of 3.0 mg/m^3 . This does not negate the outcome of other best practices to minimize employee exposure. Rather it is a recognition that there are some limitations in the efficacy of engineering controls.

6.2 Make-up Air Supply

Most grain milling equipment operates under negative pressure to achieve particle separation, segregation of grain product streams and aspiration of fine particulate matter created in the grain milling process. New milling establishments are typically designed to introduce sufficient new air during milling operations to maintain an optimal balance in the negative pressure throughout all areas of the mill.

- ▶ The balance is required to ensure the proper operation of the milling equipment in tandem with the aspiration/dust collection equipment.

6.3 Use of Compressed Air

Flour mills ensure that compressed air to remove dust from equipment, equipment superstructure and mill structural components is only used when the following conditions are met:

- ▶ The area of the mill within which compressed air is to be used for cleaning purposes is or can be isolated from other areas of the mill via fire doors or temporary barriers (screens or films) to air flow in or out of the area.
- ▶ The only persons present in the area in which compressed air is being used are those employees conducting the cleaning activity.
- ▶ Employees assigned to cleaning or blow-down duties shall be provided training on local procedures and made aware of the applicable control measures necessary to manage risks associated with blowdown activities. Signs are posted at points of entry to the area in which compressed air is being used to inform other employees to not enter.
- ▶ If employees other than those conducting the cleaning activity must enter or have entered the area, the use of compressed air for cleaning will immediately cease until those employees have left the area where compressed air is being used or are protected in a similar manner to those working in the immediate area.
- ▶ All permanently installed electrical systems, control equipment/systems and equipment motors meet Class II Division 1 or Class II Division 2 standards or the applicable mandatory standard.
- ▶ All portable equipment that could provide a source of ignition has been removed from the area of the mill in which compressed air is being used.
- ▶ All cleaning equipment, including air hoses, couplings, wands, vacuum hoses and wands are designed and maintained to properly dissipate the potential for static charges.
- ▶ All clothing, respiratory protective equipment and footwear being worn by employees conducting the cleaning activity are of a design and composition to minimize risk of conduction of electrical sparks.
- ▶ All employees using compressed air for cleaning and blow-downs of accumulated dust will wear personal protective equipment, in particular respirators or dust masks of appropriate rating such as N95, safety glasses and ear protection. Selected respirators must be properly used, maintained and in good repair at all times. All users must be clean shaven at all times while wearing the respirator in order to maximize efficiency of the protective device.

- ▶ The use of compressed air in blowdowns normally involves removal of accumulated dust from higher levels in the mill to floor levels followed by removal of the dust from floors and other surfaces using sweeping and vacuum equipment. Compressed air will not be used in place of brooms to move or collect grain dust and flour dust that has been blown down to floor areas or other surfaces.
- ▶ Air wands will be fitted with self-closing control valves.
- ▶ Air pressure must not exceed the maximum working pressure, as indicated on the device, where available, nor the level necessary to dislodge accumulated dust or cause the disturbed dust to exceed an airborne concentration of 50% of the lower explosive limit (LEL), where determined and indicated in the COHSR.
- ▶ When cleaning using compressed air is completed, all air hoses and associated equipment must be removed and/or safely hung up or otherwise stored in the usual fashion to remove risk of trips and falls.

6.4 Dust Exposure Monitoring

- ▶ All grain milling facilities shall conduct on-site dust exposure monitoring for applicable classes (by principal assigned tasks) of personnel working in grain handling and milling areas (grain cleaning, milling, packing, storage, and bulk loadout) of the facility to establish levels of dust exposure that can be anticipated by employees during a normal shift. This baseline assessment is to be conducted from time to time by qualified OHS personnel designated by the employer or under the supervision of a qualified occupational safety and health consulting firm.
- ▶ Sampling shall be conducted as per the ***Canadian Occupational Chemical Agent Compliance Sampling Guideline***¹¹ which can be found under the following Labour Program website publications: **www.canada.ca/en/employment-social-development/services/health-safety/reports.html**

6.5 Respiratory Protection Equipment

- ▶ Where atmospheric conditions exist and/or where the tasks being performed necessitate, the employer shall supply to each production employee and each supervisory employee who routinely enters grain storage and processing facilities with a respiratory protective device that is listed in the *NIOSH Certified Equipment List (CEL)*¹², as amended from time to time COHSR, 12.7(1).
- ▶ As per the CSA Standard Z94.4 *Selection, use, and care of respirators* requirements referred to in subsection 12.7(2) of the COHSR, the employer shall be responsible for preparing and implementing, in consultation with the employees, a written respiratory protection program including the following elements:
 - roles and responsibilities;
 - hazard assessment;
 - respirator selection;
 - training;
 - respirator fit testing;
 - use of respirators;
 - cleaning, inspection, maintenance, and storage of respirators;
 - health surveillance for employees diagnosed with symptoms of adverse health outcomes associated with exposure to flour dust and/or grain dust;
 - program evaluation; and
 - record-keeping.

Written procedures, as appropriate, shall also be included.

Regarding training for use of respiratory protection and other personal protective equipment:

- ▶ The employer shall provide initial and ongoing intermittent training by qualified external or in-house trainers to all production and supervisory personnel who may be required to use protective respiratory equipment during the normal course of their duties. Such equipment will be fit-tested to ensure proper fit.
- ▶ The employer shall further require that all employees receiving training demonstrate a thorough understanding and proficiency in the use of all protective respiratory equipment issued for their sole personal and shared use.

6.6 Employee Responsibilities

Section 126 of Part II of the *Canada Labour Code* stipulates:

Duties of Employees

Health and safety matters

126. (1) While at work, every employee shall

- (a) use any safety materials, equipment, devices and clothing that are intended for the employee's protection and furnished to the employee by the employer or that are prescribed;
- (b) follow prescribed procedures with respect to the health and safety of employees;
- (c) take all reasonable and necessary precautions to ensure the health and safety of the employee, the other employees and any person likely to be affected by the employee's acts or omissions;
- (d) comply with all instructions from the employer concerning the health and safety of employees;
- (e) cooperate with any person carrying out a duty imposed under this Part;
- (f) cooperate with the policy and work place committees or the health and safety representative;
- (g) report to the employer any thing or circumstance in a work place that is likely to be hazardous to the health or safety of the employee, or that of the other employees or other persons granted access to the work place by the employer;
- (h) report in the prescribed manner every accident or other occurrence arising in the course of or in connection with the employee's work that has caused injury to the employee or to any other person;
- (i) comply with every oral or written direction of a health and safety officer or an appeals officer concerning the health and safety of employees; and
- (j) report to the employer any situation that the employee believes to be a contravention of this Part by the employer, another employee or any other person.

For purposes of compliance and enforcement of grain and flour dust OELs, these obligations for employees under the COHSRs are interpreted as follows:

6.6.1 Standard Operating Procedures

Employees shall respect and observe standard operating procedures for the flour mills and components thereof that are determined and provided by the employer. Further, it is the responsibility of each employee to report to the appropriate representative of the employer (plant manager, shift supervisor) any deviation from standard operating procedures that in the opinion of the employee, presents a health or safety risk to the employee or fellow employees, including risk that may arise from abnormal exposure to grain dust or flour dust.

6.6.2 Use of Respiratory Protection Equipment

It is the responsibility of employees to wear respiratory protection equipment where the use of such equipment under defined circumstances (operating conditions and/or assigned work responsibilities) is necessary.

6.6.3 Plant Sanitation Program

Whereas all flour mill facilities operate under increasingly prescriptive regulatory and third party audit requirements for plant sanitation and food safety objectives, most mills have developed an integrated pest control and continuous plant sanitation program. These programs are often characterized by an ongoing plant cleaning schedule and responsibilities that are shared among production employees and personnel whose primary responsibilities are plant sanitation. It is the responsibility of each employee to use protective respiratory equipment provided by the employer that is deemed appropriate for the mill sanitation activity that is assigned to the employee by the employer.

6.6.4 Accident and Health Reporting

Whereas the success of ESDC-Labour Program and employers in mitigating health and safety risks of exposure to grain dust and flour dust is reliant in part on a complete understanding of the possible effects of such exposure, it is the responsibility of each employee to report in a timely fashion a health condition that could be attributable to exposure to grain dust or flour dust. These reportable conditions include:

- ▶ irritation or inflammation of the skin, particularly exposed skin such as hands, face and forearms, that routinely come into contact with milled grain products, grain dust or flour dust;
- ▶ irritation or inflammation of the eyes, nose and throat that results in persistent itching, watering, coughing or sneezing; and
- ▶ irritation of the nose, throat or lungs that results in difficulty in breathing, bronchial constriction, congestion or persistent cough.

7. Site Inspection Key Elements

7.1 Accessory powers (Powers of Officials delegated by the Minister of Labour)

Subsection 141(1) of the Code states:

The Minister may, in carrying out the Minister's duties and at any reasonable time, enter any work place controlled by an employer and, in respect of any work place, may

- (a) conduct examinations, tests, inquiries, investigations and inspections or direct the employer to conduct them;
- (b) take or remove for analysis, samples of any material or substance or any biological, chemical or physical agent;
- (c) be accompanied or assisted by any person and bring any equipment that the Minister deems necessary to carry out the Minister's duties;
- (d) take or remove, for testing, material or equipment if there is no reasonable alternative to doing so;
- (e) take photographs and make sketches;
- (f) direct the employer to ensure that any place or thing specified by the Minister not be disturbed for a reasonable period pending an examination, test, inquiry, investigation or inspection in relation to the place or thing;
- (g) direct any person not to disturb any place or thing specified by the Minister for a reasonable period pending an examination, test, inquiry, investigation or inspection in relation to the place or thing;
- (h) direct the employer to produce documents and information relating to the health and safety of the employer's employees or the safety of the work place and to permit the Minister to examine and make copies of or take extracts from those documents and that information;
- (i) direct the employer or an employee to make or provide statements, in the form and manner that the Minister may specify, respecting working conditions and material and equipment that affect the health or safety of employees;
- (j) direct the employer or an employee or a person designated by either of them to accompany the Minister while the Minister is in the work place; and
- (k) meet with any person in private or, at the request of the person, in the presence of the person's legal counsel or union representative.

Note: In handling non-compliance, the ODM's role will be to ensure that compliance activities are undertaken with the appropriate parties following the standard procedures set out in internal documents called Operational Procedures Directives (OPDs).

In order to help the flour mills' employers and employees with the implementation of the new occupational exposure limit for flour dust of 3 mg/m^3 , and achieve compliance, an ODM may take the following process into consideration:

- ▶ At the request of the industry and to ensure efficiency, flour mill site inspections may be scheduled in advance of the proposed site visit date. The ODM may schedule the site visit in consultation with the employer representative or alternate employer representative identified by the employer for the facility to be visited. This advance notice is to be provided for the employer to ensure that:
 - The appropriate employer management representative is available to accompany the ODM throughout the site inspection;
 - Work responsibilities are assigned on the day of the site visit so as to make both the employer and employee representatives of the plant health and safety committee available to accompany the ODM throughout the site inspection and completion of the key observations to be incorporated into the site visit inspection report; and
 - The facility's grain receiving, manufacturing and shipping operations are not interrupted by the site visit and related meetings.

At the milling facility, the ODM should meet with the employer's designated representative or alternate upon arrival. Unless operating or maintenance activities (such as unscheduled maintenance or pest control measures) dictate otherwise, the ODM may decide to pursue the following order:

- (1)** Meet with the designated employer representative and the employer and employee co-chairpersons (or their designated alternates) of the work place health and safety committee to discuss:
 - plant operations;
 - plant sanitation program;
 - existing dust control measures;
 - cleaning procedures;
 - use and functionality of protective equipment including preparation and implementation of a written respiratory protection programme as per the CSA Z94.4 Standard requirements;
 - illness and accident reporting; and
 - dust exposure monitoring data as they pertain to the management of flour dust levels and employee dust exposure in the facility.
- (2)** Conduct plant inspection to observe the state of sanitation of mill structure and operating equipment;
- (3)** After the inspection, meet with the designated employer representative and the employer and employee co-chairpersons (or their designated alternates) of the plant health and safety committee, to discuss and agree upon key observations for inclusion in the site inspection report.

7.2 Site Inspection Report

Within seven (7) working days of the site inspection, the ODM who conducted the site visit may provide to the designated employer representative and to the employer and employee co-chairpersons of the plant health and safety committee the results of the inspection, containing all observations and compliance action the ODM deems appropriate.

7.3 Employer Representative

The employer should, as a good practice, designate for each grain milling facility a principal management team contact person and an alternate contact to work with a Labour Program ODM to coordinate site inspections. These designated representatives should be familiar with all aspects of the layout and operations of the milling facility and in particular, with the plant sanitation program and activities of the plant level health and safety committee.

7.4 Health and Safety Committee

Health and safety committee or health and safety representative requirements are specified in the ***Policy Committees, Work Place Committees and Health and Safety Representatives Regulations***.¹³

Whereas each federally regulated employer with more than 300 employees is required to have a policy health and safety committee and in every work place a work place health and safety committee or a health and safety representative, it is appropriate that such committees are involved in the best practices approach to managing employee exposure to flour dust. This will require familiarity with this guideline document, standard operating procedures of the production areas of the facility, the plant sanitation program and respiratory protection programme established based on the CSA Z94.4 Standard, Selection, use, and care of respirators.

7.5 Hazard Investigation Requirement (COHSR, 10.4)

If, as a result of the site inspection, the ODM or any member of the inspection party ascertains that there is a likelihood the health or safety of an employee in a flour mill is or may be endangered by exposure to flour dust or any other hazardous substance, the employer shall, without delay,

- ▶ appoint a qualified person to carry out an investigation in that regard; and
- ▶ for the purpose of providing for the participation of the work place committee or the health and safety representative in the investigation, notify either of the proposed investigation and of the name of the qualified person appointed to carry out the investigation.

The criteria to be taken into consideration in an investigation are specified in subsection 10.4(2) of the COHSR.

Reference should also be made to the ESDC Labour Program document ***Guide to the Management of Hazardous Substances***¹⁴ for more details on hazard investigations.

7.6 Hazard Investigation Report

On completion of the investigation and after consultation with the work place committee or the health and safety representative, the qualified person must set out in a written report signed by the qualified person (COHSR, 10.5):

- ▶ the qualified person's observations respecting the criteria considered in the investigation;
- ▶ the qualified person's recommendations respecting the manner of compliance with respect to Part X of the COHSR, including recommendations respecting sampling and testing methods; and
- ▶ the employer shall develop and maintain a written procedure for the control of the concentration of flour dust and or any other hazardous substance in the flour mill.

It is also necessary that the report be kept by the employer for a period of thirty years after the date on which the qualified person signed the report (COHSR, 10.6).

7.7 Sampling Methodology

Section 10.19(3) of the COHSR identifies acceptable procedures for air sampling in federally regulated work places where the concentration of an airborne substance such as flour dust may exceed the prescribed occupational exposure limit for this substance. Section 10.19(4) prescribes record-keeping for test results.

Sampling must be conducted in accordance with the ***Canadian Occupational Chemical Agent Compliance Sampling Guideline***.¹¹ Briefly stated, sampling involves taking personal samples from exposed employees, as determined by a qualified person, over the full work shift. Concentrations of inhalable flour dust must be sampled and analyzed in accordance with the Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST) method 373. A pump connected to an Institute of Occupational Medicine (IOM) sampler draws air through the employee's breathing zone at an approximate flow rate of 2.0L/min as (s)he works.

Concentrations of grain dust must be sampled and analyzed in accordance with NIOSH method 0500.¹⁵ A pump connected to a 37-mm sampling cassette containing a PVC filter draws air through the employee's breathing zone at an approximate flow rate of 1.7L/min as (s)he works.

8. Contact information

Labour Program Telephone no.: 1-800-641-4049

www.canada.ca/en/employment-social-development/corporate/portfolio/labour.html

9. References

- ¹ Karpinski, Eva, P.Eng. Exposure to Inhalable Flour Dust in Canadian Flour Mills, Human Resources Development Canada, Labour Branch. May 2001.
- ² American Conference of Governmental Industrial Hygienists (ACGIH). Signature Publications. **Threshold Limit Values (TLVs®) and Biological Exposure Indices (BEIs®)**. 2018.
- ³ Karpinski, Eva A. Exposure to Inhalable Flour Dust in Canadian Flour Mills. 2003. Applied Occupational and Environmental Hygiene, 18: 1022-1030.
- ⁴ **Canada Occupational Health and Safety Regulations (COHSR)**. SOR/86-304. *Canada Labour Code*. Registration 1986-03-13.
- ⁵ **Canada Grain Act**.
- ⁶ **Canada Labour Code (CLC)**, RSC 1985, c L-2.
- ⁷ Flour dust – General information sheet
www.canada.ca/en/employment-social-development/services/health-safety/reports.html
- ⁸ Grain dust – General information sheet
www.canada.ca/en/employment-social-development/services/health-safety/reports.html
- ⁹ American Conference of Governmental Industrial Hygienists (ACGIH). Signature Publications. Industrial Ventilation A Manual of Recommended Practice for Design. 29th Edition. 2016.
- ¹⁰ Canadian Standards Association. **CAN/CSA-Z94.4-11. (R2016). Selection, Use, and Care of Respirators**.
- ¹¹ Ziembicki, Matthew; Karpinski, Eva; de Repentigny, France. **Canadian Occupational Chemical Agent Compliance Sampling Guideline**. 2015. ESDC Labour Program.
- ¹² NIOSH **Certified Equipment List (CEL)**
- ¹³ **Policy Committees, Work Place Committees and Health and Safety Representatives Regulations**.
- ¹⁴ **Guide to the Management of Hazardous Substances. 2015**. ESDC Labour Program.
- ¹⁵ **National Institute for Occupational Safety and Health Manual of Analytical Methods (NMAM™)**, 4th ed. DHHS (NIOSH) Method 0500, Issue 2 (August, 1994).

